MAN-000420-000
Rev. 1.5
May 20, 1994

CQD-420/423

High Performance Q-bus
FAST SCSI-2 Smart Host Adapter
User's Manual

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Class A Computing Device:
This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

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BASIC WARRANTY - In the absence of any optional warranty or continuing provisions by formal agreement, CMD warrants its products in accordance with the schedules listed below. Purchaser hereafter mentioned refers at all times to the customer who purchased CMD product(s).

HOST ADAPTER WARRANTY - CMD warrants Host Adapter products of its manufacture to be free from defect in material and workmanship for a period of one year from the date of shipment. During this period, if the customer experiences difficulties with a CMD Host Adapter and is unable to resolve the problem via phone with CMD Technical Support, a Return Material Authorization (RMA) will be issued. Following receipt of an RMA, the Purchaser is responsible for returning the product to CMD, freight prepaid. CMD, upon verification of warranty, will repair or replace at its option the Host Adapter in question, and will then return the product to the Purchaser, freight prepaid.

CABLE WARRANTY - All CMD provided cables are warranted for ninety (90) days from the time of shipment. Questionable cables should be returned to CMD, freight prepaid, where they will be repaired or replaced by CMD at its option and returned to the Purchaser, freight prepaid.

GENERAL TERMS - The above warranties shall not apply to expendable components such as fuses, bulbs, and the like, nor to connectors, adapters, and other items not a part of the basic product. CMD shall have no obligation to make repairs or to cause replacement required through normal wear and tear or necessitated in whole or in part by catastrophe, fault or negligence of the user, improper or unauthorized use of the product, or use of the product in such a manner for which it was not designed, or by causes external to the product, such as, but not limited to, power failure or air conditioning. CMD's sole obligation hereunder shall be to repair or replace any defective product, and, unless stated, pay return transportation costs within the United States of America for such replacement. Purchaser shall provide labor for removal of the defective product, shipping charges for return to CMD and installation of its replacement. On-site services are not a part of this warranty. Above warranties are subject to change without notice.

RETURNED MATERIAL - Warranty claims must be received by CMD within the applicable warranty period. A replaced product, or part thereof, shall become the property of CMD and shall be returned to CMD at Purchaser's expense. All returned material must be accompanied by a Return Materials Authorization (RMA) number assigned by CMD. For RMA numbers call CMD at (714) 454-0800.

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Return and Repair Policy

WARRANTY PERIOD

The following warranty period is from the date of shipment:

CMD Host Adapter	one year
Cable	90 days
Drive	manufacturer's warranty

RETURN FOR CREDIT

The allowable period of return for credit from the date of shipment is as follows

CMD Host Adapter	less than 30 days
Cable	less than 30 days
Drive	not applicable

RETURN FOR REPAIR

CMD Host Adapter

In-Warranty (Less than 1 year)

- CMD offers a *15 working day turnaround repair service* at the cost of parts only. Defective boards will be repaired and returned to the customer within 15 working days from the date of return to CMD.
- CMD also offers two *in-warranty 24 hour expediting services:*

  24 Hour Turnaround Loaner Service:

  Under this policy, CMD will ship a loaner in 24 hours during regular working days to the customer for a charge of $100.00 per loaner. Upon receiving the loaner, customer must return the defective board to CMD within seven (7) days for repair. CMD will repair the defective board and return the board to the customer. Customer must then return the loaner in seven (7) days after the receipt of the repaired board. Approval for loaner service is based on credit verification.

  24 Hour Turnaround Swap Service:

  In the case that the defective board is within the first six (6) months of the warranty, CMD, at its own option, offers a 24 hour turnaround swap service. CMD will ship the same model of the board to customer within 24 hours during working days in exchange for the defective board. CMD will swap with a new board if board is not functional upon arrival. For all other cases, swap will occur with either a new or refurbished board for a charge of $200.00. CMD does not offer swap services for boards that are purchased more than six months from the date of shipment. Customer is responsible for returning the defective board to CMD within seven (7) days after receipt of the swapped board.
- The remaining warranty period shall apply to the repaired or swapped board.

Out-of-Warranty (more than 1 year)

- CMD offers a *15 working day turnaround repair service* at a rate of $300.00 plus parts and freight for all out-of-warranty host adapter boards. Defective boards will be repaired and returned to customer within 15 working days starting with date of return to CMD.
- CMD also offers an *Out-of-Warranty 24 Hour Turnaround Loaner Service:* Under this policy, CMD will ship the same model loaner in the 24 hour time frame of working days to customer for an additional charge of $100.00 plus freight per loaner. The loaner is for use by the customer during the period that the defective board is being repaired. Customer is responsible for returning the defective board to CMD within seven days after the receipt of loaner and returning the loaner in seven (7) days once the defective board is repaired and received. The approval of the loaner service is at CMD's option and based upon customer credit verification.
- CMD will extend warranty for a period of six (6) months on any out of- warranty repaired board.

Cable

In-Warranty (90 days) - free swap.

Out-of-Warranty (90 days) - not applicable.

Drive

In-Warranty (per manufacturer) - manufacturer charge only.

Out-of-Warranty (per manufacturer) - manufacturer charge plus $100 CMD handling.

RETURN FOR UPGRADE/ UPDATE

CMD Host Adapter

In-Warranty (less than 1 year)

- CMD offers a *15 working day turnaround different function upgrade service* for boards that can be upgraded to a higher function; and a *free 15 working day turnaround ECO Field Upgrade* for all its boards. CMD will *upgrade* the hardware of its board to a higher function for a charge of the difference of list prices of the original and upgraded functions. CMD will also update its board to its latest firmware release at no charge to the customer. Boards will be upgraded/updated and returned to the customer within 15 working days from the date of return to CMD.
- CMD also offers *24 hour turnaround loaner service* as stated in "RETURN FOR REPAIR."
- The remaining warranty period shall apply to the updated board. For upgraded boards, CMD will extend warranty for a period of six months.

Out-of-Warranty (More than 1 year)

- CMD offers a *15 working day turnaround different function upgrade service* for boards that can be upgraded to a higher function at a charge of the difference of list prices of two functions. CMD also offers a *free 15 working day turnaround ECO Field Upgrade* for all its boards. Boards will be upgraded/updated and returned to customer within 15 working days from the date of return to CMD.
- CMD also offers *24 hours turnaround Loaner Service* as stated in "RETURN FOR REPAIR."
- There will be no warranty extension for same function firmware update. For different function Hardware upgrade, CMD will extend warranty for a period of six (6) months.

Drive—same as in RETURN FOR REPAIR.

SHIPPING CHARGES

The following shipping charges apply to all REPAIR, SWAP, LOANER, and UPGRADE UNITS.

In-Warranty

- Domestic - freight from CMD to customer is to be paid by CMD; freight from customer to CMD is to be paid by customer.
- International - all fees are to be paid by customer (including custom duty and broker fees).

Out-of Warranty

- Domestic - all fees are to be paid by customer.
- International - all fees are to be paid by customer (including custom duty and broker fees).

GENERAL CONDITIONS

All goods returned to CMD including returns for credit, swap returns, loaner returns, and evaluation returns shall remain in good condition. Any damage or alteration done by the customer will result in a rejection or additional charge to the customer.

Customer must consult CMD Technical Support for authorization of CMD not functional upon arrival boards and swap requests. CMD Sales personnel must be consulted for authorization of returned goods for credit and/or evaluation.

Preface

The CQD-420/423 Rev 1.5 differs from the previous version in the following respects:

- Chapter 4 has been updated with the latest changes to the CQD-420/423's on-board utility.
- The description of hardware shadowing in Chapter 4 has been expanded.

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1

Introduction

This User's Guide explains the basics of your CQD-420™. It includes information on setting up and configuring the system and the CQD-420 for use.

How to Use this Manual

This guide has five chapters and four appendices. Each chapter explains a different aspect of preparing your CQD-420 for use. You may refer to the appendices for further configuration and troubleshooting information. The following descriptions summarize each section.

Chapter 1: Introduction explains the purpose of this guide and details the conventions used.

Chapter 2: CQD-420 Features describes the CQD-420 and details its features, special features, and specifications.

Chapter 3: Installation describes hardware configuration and installation procedures for the CQD-420.

Chapter 4: Setup describes setting up and configuring the CQD-420 and your system for use; this chapter includes Multi-hosting, Partitioning, Shadowing, VMS®, and ULTRIX® set up and configurations.

Chapter 5: SCSI Basics lists a glossary on SCSI terms, SCSI status and command codes for the CQD-420.

Appendix A: Supported Devices and Operating Systems lists the SCSI devices and operating systems compatible with the CQD-420.

Appendix B: Troubleshooting gives some troubleshooting guidelines for the CQD-420.

Appendix C: Jumper Settings lists the jumpers settings, pin assignments, and the CSR addresses for the present revision of the CQD-420.

Appendix D: VMS SYSGEN Connect Statement describes the proper use of the VMS SYSGEN Connect Statement.

Conventions

The following conventions are used in the CQD-420 User's Guide.

Keycaps—Characters in square brackets represent keys on your keyboard. For example, "Press **[ENTER]**" means press the **[ENTER]** key. When two or more keys are joined by a plus sign (+), press those keys at the same time.

Commands—Italics text represents a command that can be used on a system, such *show dev du*.

NOTE Sometimes italics will be used for emphasis; at this time no action is necessary; for example, *do not* remove jumper shunt W3.

Entering Text or Commands on Screen—Text or commands that must be entered on screen will be in italics and bold as ***show dev du***; be sure to enter the text or command and press **[ENTER]**.

2

Features and Specifications

The CQD-420 is an intelligent high performance quad-wide Q-bus single-ended/differential synchronous/asynchronous (sync/async) SCSI-2 Host Adapter. The following sections describe the CQD-420 in more detail.

Features

The CQD-420 is fully compatible with the DEC Mass Storage Control Protocol (MSCP) and Tape Mass Storage Control protocol (TMSCP).

The CQD-420 employs ASIC technology to cut down the number of chips on the circuit board, which enhances the adapter's reliability and reduces its power consumption.

The CQD-420 has one SCSI port which supports either single-ended or differential SCSI channels. You can use the single-ended SCSI channel for connecting up to 20-feet cable or the differential SCSI channel for connecting up to 80-feet cable.

The CQD-420 can be used with the LSI-11/23®, PDP-11/23+, Micro-PDP-11/53®, 11/73, 11/83, 11/93, MicroVAX® II, and MicroVAX III, VAX 4000® and DECsystem® 5400 systems. It supports RT-11®, TSX®, DSM-11®, ISM-11®, RSX®, RSTS®, VMS, UNIX®, ULTRIX, and other operating systems which use DU/TU drivers.

The CQD-420 has Adaptive Dwell for Q-bus; active termination for single-ended channel to improve SCSI bus noise immunity; and polyswitch (self-healing) fuses that do not need to be replaced.

The CQD-420 features 18-bit or 22-bit Q-bus addressing, block mode and adaptive DMA transfer, virtual data buffer, command queuing, dynamic defect management, standard SCSI bus arbitration, disconnect and reconnect capability, multiple-host capability, and all required SCSI commands. Up to seven (either single-ended or differential) synchronous, asynchronous or mixed SCSI devices can be connected to the CQD-420 with SCSI bus data transfer rate up to 10-MB/sec in synchronous mode (fast SCSI) and 7-MB/sec in asynchronous mode.

The CQD-420 supports a variety of Sync/Async SCSI devices including magnetic disk, magnetic tape and optical disk drives. Table 2-1 lists the different models of the CQD-420 and their features.

Table 2-1 CQD-420 Models

CQD-420/TM	supports disk and tape drives simultaneously
CQD-420/TMS	supports disk and tape drives and hardware shadowing
CQD-423	contains the CQD-420 models and a MicroVAX III and VAX4000 adapter kit. A shielded SCSI cable (with shielded connectors) is required to connect the CQD-423 to SCSI devices.

NOTE Unless otherwise specified, the CQD-420 will represent all of the variations through this manual and the CQD-420/TM will represent the CQD-420/TMS variations.

The CQD-420 has an On-Board Utility for you to format and configure the SCSI devices, scan bad blocks and replace them automatically.

For LSI systems only, the CQD-420 contains a selectable bootstrap option which can boot up the system on power up or reset. The CQD-420 has an On-Board Utility for you to boot up the system or exercise the tape drives.

The CQD-420 has an on-board non-volatile RAM (NOVRAM) to store the Logical Unit Number (LUN) Offset and other important information of the controller configuration.

The CQD-420 SCSI host adapter provides you with a 10 pin connector (J2) for the On-Board RS-232 Utility. The CQD-423 provides you with a DEC compatible RJ-11/Modified Module 423 Jack (MMJ) for accessing the On-Board RS-232 Utility. See Appendix C for pin assignments.

LED Indicators

The CQD-420 has two LED modules in the front of the board. The LED modules contain two LED's and are labeled DS1 and DS2 (see Figure 2-1).

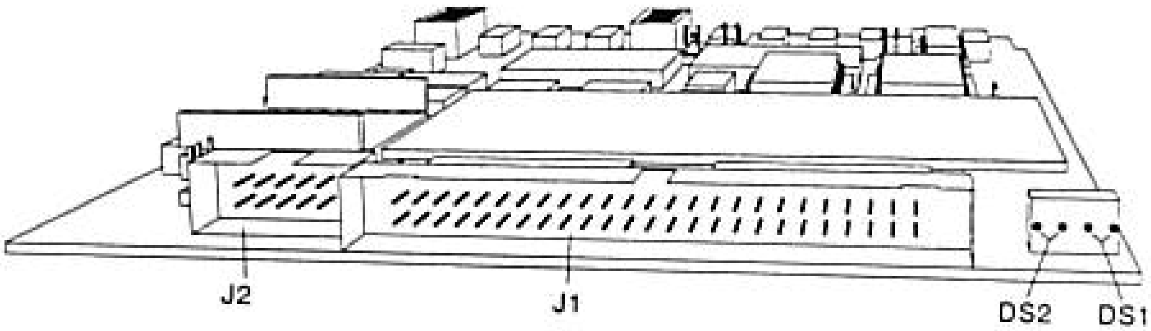


Figure 2-1: LED Indicators

Table 2-2 lists the LED indicators for CQD-420.

Table 2-2 LED Indicators

LED	Color	Location	Indication
DS1	Green	second from right	Power-up OK and activity indicator. Upon power up, this LED is turned on when the CQD-420 succeeds in the self-diagnostic testing. During normal controller operation, this LED will blink to show controller activity.
	Red	far right	Error condition occurred
DS2	Green	second from left	Terminator power pin is supplied with power.
	Green	far left	Single-ended SCSI channel enabled when on. Differential SCSI channel enabled when off.

Special Features

The CMD CQD-420 controller provides special features, such as multi-hosting, partitioning, hardware shadowing, Tape Monitor Utility(TMU), and on-line formatting (FMT). Table 2-3 lists the special features.

Table 2-3 Special Feature Support List

Model	Multi-hosting	Partitioning	TMU	FMT	Shadowing
/TM	Yes	Yes	Yes	Yes	No
/TMS	No	No	Yes	Yes	Yes

Multi-Hosting

CMD's multi-host solution can support disk, tape, and optical devices including jukeboxes. It gives you the ability to completely share an array of disks and tapes between multiple VAX systems running VAX cluster software. Multi-hosting configuration instructions are given in Chapter 4. Refer to Appendix A for supported disk and tape devices.

Partitioning

CQD-420 gives you the ability to partition devices. Partitioning makes one physical device appear as two or four equal sized logical devices. Partitioning is used for operating systems that do not support large devices such as RT-11. Partitioning configuration instructions are given in Chapter 4.

Tape Monitor Utility

The Tape Monitor Utility™ (TMU) is an application software that works exclusively with CMD SCSI host adapters as an optional feature for VAX/VMS systems.

This Tape Monitor Utility™ displays the tape drive vendor identification, drive firmware revision, the remaining tape capacity, percentage/number of rewrites during writes or percentage/number of ECC retrys during reads (see manufacturer's documentation for returns whether percentages or numbers), and current tape operations such as read, write, write file mark, space, rewind, etc. You can install multiple CQD-420's and tape drives in one site and observe all tape activity from any VAX terminal locally or across the network without any additional add-in hardware. You can also open a file to log all the information during unattended backup.

To install the Tape Monitor Utility, follow the instructions given in the accompanying CMD Tape Monitor Utility User's Manual part number MAN-000TMU-000 and install jumper shunt as given in Chapter 3, subsection "Tape Monitor Utility and SCSIformat ON-LINE."

SCSIformat ON-LINE

The SCSIformat ON-LINE (FMT) is an application software that works exclusively with CMD SCSI host adapters as an optional feature for VAX/VMS systems. This SCSIformat ON-LINE allows you to format the disk drives without interfering with the other devices on the SCSI bus. To install SCSIformat ON-LINE follow the instructions given in the accompanying SCSIformat ON-LINE User's Manual and install jumper shunt as given in Chapter 3, subsection "Tape Monitor Utility and SCSIformat ON-LINE."

Hardware Shadowing

The Super Shadow CQD-420/TMS is a hardware variation of the CQD-420/TM. Installation and setup of CMD shadowing host adapters are simplified with the CMD On-Board Utilities. This easy to use menu-driven utility allows you to quickly configure virtually any combination of disk shadow sets. See Chapter 4 for Hardware Shadowing Configuration.

The hardware disk shadowing on DEC computers enables simultaneous writing of data to two shadow set members. This provides an exact real-time duplicate data set that can be later retrieved by the user if data on primary disk becomes unaccessible.

The access performance benefits are derived from the ability to read data from a particular disk in the shadow set that responds faster. By adapting specific host adapter resident firmware algorithms, CQD-420/TMS provides incredible performance benefits with disk access time reduced 100% or more during reads.

The hardware-based shadowing technique also results in far less VMS overhead and much higher data availability than software solutions.

You can now configure complete SCSI drive failure tolerant subsystems built around Super Shadow host adapters. When used in conjunction with other CMD exclusive features like Multi-Host capability, subsystem data availability can be increased substantially.

Specifications

Table 2-4 lists the controller specifications for the CQD-420.

Table 2-4 Controller Specifications

Emulation	MSCP (*DU* driver) / TMSCP (*TU* driver)
Bus Interface	Standard MicroVAX or LSI-11 Q-bus
Addressing	22-bit Addressing
Interrupt Priority	Level 4
Interrupt Vector	Software programmable
Transfer Mode	Normal or block mode DMA
DMA Dwell	Adaptive Dwell
Command Queuing	Commands with optimized seek
Data Buffer Capacity	Virtual data buffer (infinite size)
Bootstrap	Auto bootstrap or utility bootstrap
Defect Management	Dynamic defect management
Software Supported	All standard DEC operating systems
Multiple-Hosting	Support multiple-hosting for disks, optical drives and tapes.
Formatting	On board format and bad block replacement (ISO standard for optical erasable disk format)
Partitioning	2 or 4 equally divided partitions for disk drives
Shadowing	Any two disk drives on the bus can form a shadow set (for /TMS version only)
Optional Software	Tape Monitor Utility (TMU) SCSIformat ON-LINE (FMT)
LED Indicators	Self test, error conditions
Peripheral Interface	Small Computer System Interface (SCSI-2)
SCSI Transfer Rate:	10-MB/sec in Synchronous mode (Fast SCSI) 7-MB/sec in Asynchronous mode
SCSI Bus Parity	Odd parity
Devices Supported	Up to 7 SCSI devices (single-ended or differential) in any combination of disk or tape drives (def. = 4 disks/3 tapes)
System Performance	Support disconnect/reconnect capability and multiple-host configuration
SCSI Driver/Receiver	Single-ended or differential
SCSI Fuse	Self-healing, 1.5 A polyfuse
SCSI Termination	Single-ended—active termination (removable) Differential—removable
SCSI Cable Length	Single-ended, up to 20-feet (6-meters) Differential, up to 80-feet (25-meters)
Operating Temperature	5° C to 50° C
Relative Humidity	10% to 90% , Non-condensing
Power Requirement	5V DC, 2.0 A max. differential, 1.5A max. single-ended

Table 2-5 lists the CSR addresses for the CQD-420. For complete CSR addresses, see Chapter 3 and Appendix C.

Table 2-5 CSR Addresses

CQD-420/TM (Disk) IC P42001A (U30)	772150, 760334, 760354, 760374, 760340, 760344, 760350, 760360 and 23 additional CSR addresses
CQD-420/TM (Tape) IC P42001A (U30)	774500, 760404, 760444, 760504, 760544, 760410, 760450, 760454 and 23 additional CSR addresses

3

Installation

This chapter instructs you on configuring the CQD-420 and installing it into the system. Follow the instructions in this chapter in the order presented.

Determining CSR Address

Before you install the CQD-420 SCSI host adapter under the VMS operating system you must determine the Control and Status Register (CSR) address for the CQD-420.

For the CQD-420/TM, two CSR addresses are required. The following procedure shows one method of determining the new CSR address for the CQD-420.

WARNING **Do not install the new CQD-420 in the system at this time.**

1. Boot the VMS system and log into the system manager account.
2. At the DCL *$* prompt, enter *MC SYSGEN.*
3. At the prompt *SYSGEN,* enter *SHOW/CONFIG.* The SYSGEN Utility will display all the device controllers installed in the system and their corresponding CSR addresses and vectors. Make a note of this list.
4. At the prompt *SYSGEN,* enter *CONFIG.* This will give you the *DEVICE* prompt

5 At the prompt *DEVICE*, enter the following for your CQD-420:

enter *UDA, X*
and *TU81, Y*

where
X is the number of installed *UDA* type controllers plus 1 (for the new one being added).
Y is the number of installed *TU81* type controllers plus 1 (for the new one being added).

NOTE Enter all devices on the Q-bus, not just the new device being added at present.

6 At the prompt *DEVICE*, enter [CTRL] + Z. The SYSGEN Utility will display the CSR addresses for all the controllers. Make sure that no other vectors or CSR addresses have changed; if they have, make the appropriate changes to the devices.

The VMS mnemonic for MSCP disk controllers are PUA, PUB, PUC, etc. The VMS mnemonic for TMSCP tape controllers are PTA, PTB, PTC, etc. For other mnemonics, refer to VMS system manager's guide.

Use the corresponding CSR address to configure the CSR jumper settings of the CQD-420 (see "CSR Address Selection").

7 At the prompt *SYSGEN*, enter [CTRL] + Z to exit the SYSGEN Utility.

NOTE VMS will automatically program the CQD-420's interrupt vector register to match the vector assigned by the system. The vectors of DHV11 or other controllers might change when the CQD-420 is added to the system; see manufacturer's documentation to configure vectors and device CSR addresses if hardware selectable.

The example in Figure 3-1 explains the SYSGEN Utility procedure for installing the CQD-420 in VMS system. In this example, the CSR addresses of PUB and PTB should be used to configure the CSR jumpers of the CQD-420. In the example, notice the CSR and vector changes for the DHV11.

```
$ MC SYSGEN
SYSGEN> SHOW/CONFIG

System CSR and VECTOR on 2-JUN-1989 04:10:43.30

Name: PUA Units:1  Nexus:0 (UBA)  CSR:772150  Vector:774  Vector2:0
Name: PTA Units:1  Nexus:0 (UBA)  CSR:774500  Vector:260  Vector2:0
Name: TXA Units:16 Nexus:0 (UBA)  CSR:760440  Vector:300  Vector2:304

SYSGEN> CONFIG
DEVICE> UDA,2
DEVICE> TU81,2
DEVICE> DHV11,1
DEVICE> ^Z

Device: UDA     Name: PUA   CSR: 772150   Vector:154    Support: Y
Device: TU81    Name: PTA   CSR: 774500   Vector:260    Support: Y
Device: UDA     Name: PUB   CSR: 760334*  Vector:300*   Support: Y
Device: TU81    Name: PTB   CSR: 760404*  Vector:304*   Support: Y
Device: DHV11   Name: TXA   CSR: 760500   Vector:310*   Support: Y

SYSGEN>  ^Z
$
```

Figure 3-1: Example of SYSGEN Utility

Hardware Configuration

Normally, you do not need to change the factory jumper settings of the CQD-420 except for the CSR address jumper SW2 as shown in the following subsections.

CSR Address Selection

The CQD-420 jumpers allow you to select different CSR addresses. If you require other CSR addresses than listed, consult CMD Technology.

The CQD-420/TM with the IC P42001A in U30 supports 31 disk and 31 tape CSR addresses. Only eight disk and tape CSR jumper settings are shown in Table 3-1 and Table 3-2. Refer to Appendix C for the other CSR jumper settings.

WARNING **Be sure to wear anti-static wrist straps or equivalent to protect the CQD-420 from electro-static damage.**

Table 3-1 **CQD-420 CSR jumper settings for disk**

Address	LSI-11	MicroVAX	SW2 -1	SW2 -2	SW2 -3	SW2 -4	SW2 -5
1	17772150	20001468	ON	ON	ON	ON	ON
2	17760334	200000DC	ON	ON	ON	ON	OFF
3	17760354	200000EC	ON	ON	ON	OFF	ON
4	17760374	200000FC	ON	ON	ON	OFF	OFF
5	17760340	200000E0	ON	ON	OFF	ON	ON
6	17760344	200000E4	ON	ON	OFF	ON	OFF
7	17760350	200000E8	ON	ON	OFF	OFF	ON
8	17760360	200000F0	ON	ON	OFF	OFF	OFF
Disable when no disk devices installed			OFF	OFF	OFF	OFF	OFF

Table 3-2 **CQD-420 CSR jumper settings for tape**

Address	LSI-11	MicroVAX	SW2 -6	SW2 -7	SW2 -8	SW2 -9	SW2-10
1	17774500	20001940	ON	ON	ON	ON	ON
2	17760404	20000104	ON	ON	ON	ON	OFF
3	17760444	20000124	ON	ON	ON	OFF	ON
4	17760504	20000144	ON	ON	ON	OFF	OFF
5	17760544	20000164	ON	ON	OFF	ON	ON
6	17760410	20000108	ON	ON	OFF	ON	OFF
7	17760450	20000128	ON	ON	OFF	OFF	ON
8	17760454	2000012C	ON	ON	OFF	OFF	OFF
Disable when no tape devices installed			OFF	OFF	OFF	OFF	OFF

If you are not installing any disk devices, disable the disk CSR. If you are not installing any tape devices, disable the tape CSR. Please refer to Figure 3-2 for jumper locations.

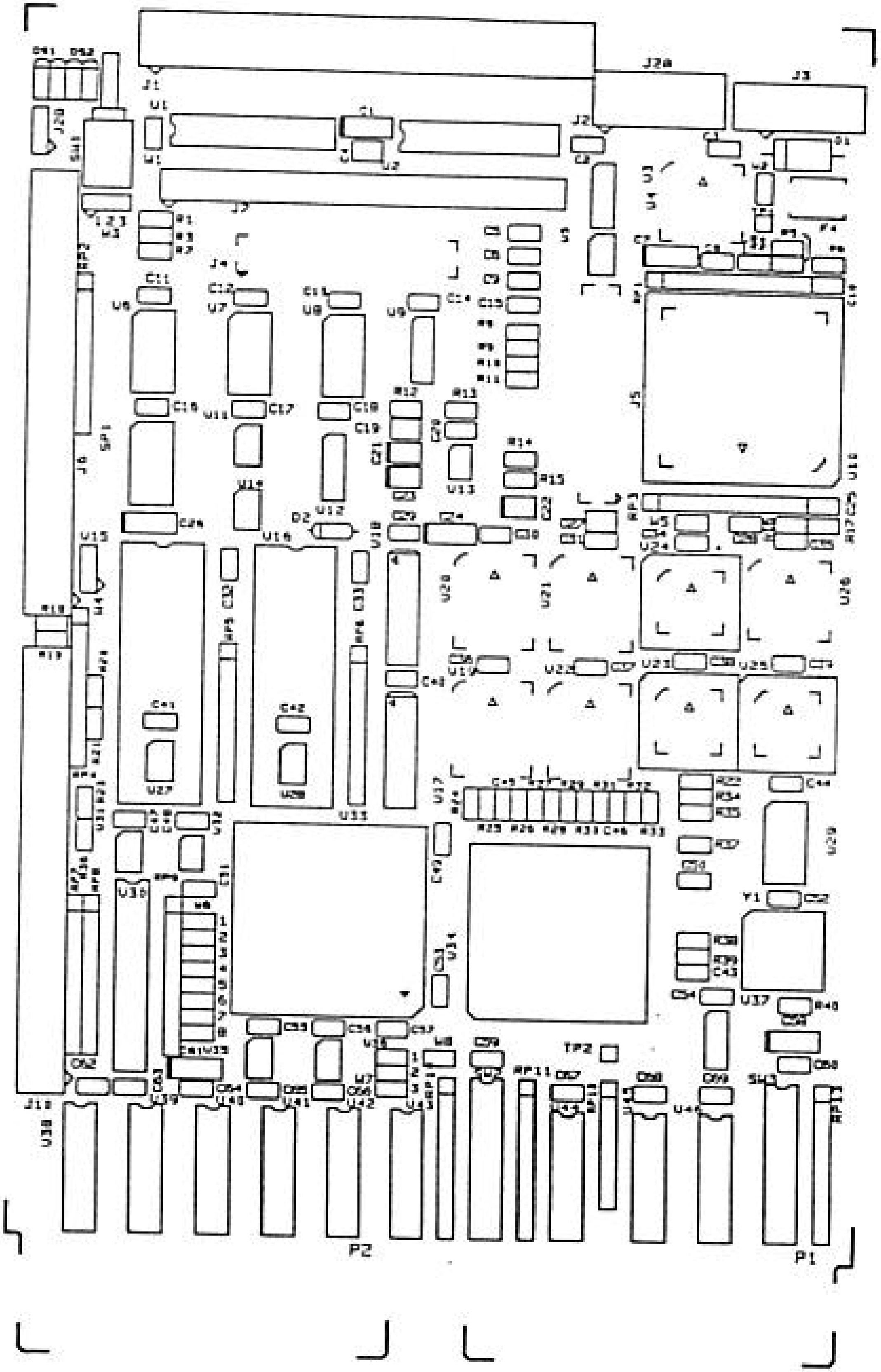


Figure 3-2: Jumper block locations

Disk Auto Boot Selection

Disk Auto Boot Selection is used for the LSI-11 processors only. The CQD-420 may be set to provide an auto-bootstrap at 775000, 773000 or 771000 on power up or whenever the "boot" switch is pressed. Disk drive 0 will be bootstrapped. Table 3-3 lists Disk Auto Boot Selections.

Table 3-3 Disk Auto Boot Selection

W6-6	W6-7	
OUT	OUT	Auto-Bootstrap disabled (F)
IN	OUT	Auto-Bootstrap address = 775000
OUT	IN	Auto-Bootstrap address = 773000
IN	IN	Auto-Bootstrap address = 771000

Note that (F) means factory setting.

If there is an existing bootstrap ROM at 773000, you must set the CQD-420 auto-bootstrap address at 771000. To boot the CQD-420, type 771000G from ODT instead of the normal 773000G.

18- or 22-Bit Address Selection

The CQD-420 is factory configured to 22-bit addressing which is used in systems with the MicroVAX, LSI-11/23/53/73/83/93 and Mentec M80, M90, M100 processors. 22-bit addressing can cause problems if used with an 18-bit processor such as the LSI-11/2. In this case, configure the board to 18-bit by cutting the etch between W8 1-2 (see Figure 3-2 for jumper block locations).

Interrupt Level Selection

Interrupt Level Selection allows you to select the priority of interrupting the CPU for MSCP devices. The CQD-420 is shipped with interrupt level 4 selected; this is standard interrupt priority for MSCP devices.

Block Mode DMA

Block Mode DMA allows the CQD-420 to transfer data in blocks rather than single word per memory address assertion. In a Block Mode Direct Memory Access (DMA) transfer, the starting memory address is asserted, followed by data for that address, and data for consecutive addresses. Because the assertion of the address for other data words are eliminated, higher data throughput can be achieved. The CQD-420 is shipped with Block Mode DMA enabled as shown in Table 3-4.

Table 3-4 **Block Mode DMA**

W6-5	OUT	Block mode DMA enabled (F)
W6-5	IN	Block mode DMA disabled

Note that (F) means factory setting.

Adaptive DMA

Adaptive DMA allows the CQD-420 to release the Q-bus after a block (eight words) transfer if other DMA devices assert DMA request. Otherwise, the CQD-420 will continue the DMA transfer for an additional block then release the Q-bus. Adaptive DMA is implemented to utilize the Q-bus bandwidth. The CQD-420 is shipped with Adaptive DMA enabled as shown in Table 3-5.

Table 3-5 **Adaptive DMA**

W6-1	OUT	Adaptive DMA enabled (F)
W6-1	IN	Adaptive DMA disabled

Note that (F) means factory setting.

DMA Dwell Time

DMA Dwell Time is the relaxation period between DMA requests. Normally, if multiple DMA data transfers are performed, consideration must be given to the Q-bus for other system functions, such as communication multiplexer, network, etc. During the DMA dwell time, the CQD-420 will not arbitrate for the use of the Q-bus. You can select the period of the DMA Dwell Time by changing the jumper shunts listed in Table 3-6.

Table 3-6 **DMA Dwell Time**

W6-3	W6-4	DMA dwell time
IN	IN	0.8-µs DMA dwell time
OUT	IN	1.6-µs DMA dwell time
IN	OUT	3.2-µs DMA dwell time (F)
OUT	OUT	6.4-µs DMA dwell time

Note that (F) means factory setting.

Adaptive DMA Dwell Time

When Adaptive DMA Dwell Time is enabled, the CQD-420 monitors the DMA activity, if other devices are requesting the bus, the Dwell Time will be determined by W6 as shown in Table 3-6. If no other device is requesting the bus, the CQD-420 will request the bus immediately. This feature allows the CQD-420 to be both fast and fair to other devices on the Q-bus. You can select Adaptive Dwell DMA Time by changing the jumper shunts listed in Table 3-7.

Table 3-7 **Adaptive DMA Dwell Time**

W6-2	OUT	Adaptive DMA Dwell time enabled (F)
W6-2	IN	Adaptive DMA Dwell time disabled

Note that (F) means factory setting.

Tape Fast Search Option

When set to the Tape Fast Search mode, the CQD-420 will enable high speed forward and reverse filemark search. VMS may use this mode if you do not attempt a standalone boot or run other programs that require the controller to keep track of the number of data records between filemarks. In VMS standalone boot application, this option needs to be disabled. For the ISM-11 operating system, this jumper shunt has to be installed. CMD recommends you use this option for ULTRIX and UNIX systems. Table 3-8 lists the jumper settings.

Table 3-8 Tape Fast Search Option

SW3-4	ON	Enable tape fast search option
SW3-4	OFF	Normal operation (F)

Note that (F) means factory setting.

Sync/Async Mode Selection

The CQD-420 comes standard in synchronous (sync) mode. Most SCSI devices support to sync mode. In sync mode, CQD-420 will automatically communicate with each SCSI device connected to find out whether the sync mode is supported by the device.

In async mode, CQD-420 will communicate with the SCSI device asynchronously even if the SCSI device supports sync mode. Most of the sync SCSI devices also support async. mode.

You can change the CQD-420 to async mode using the jumpers listed in Table 3-9; these jumpers control the overall sync/async mode selection and will override the On-Board Utility sync mode set-up.

Table 3-9 Sync/Async Mode Selection

SW3-6	ON	Tape sync mode disabled
SW3-6	OFF	Tape sync mode enabled (F)
SW3-7	ON	Disk sync mode disabled
SW3-7	OFF	Disk sync mode enabled (F)

Note that (F) means factory setting.

Tape Monitor Utility and SCSIformat ON-LINE

As explained in Chapter 2, the Tape Monitor Utility will allow you to monitor tape devices on the SCSI bus; and the SCSIformat ON-LINE will allow you to format SCSI devices through the CQD-420 and the software provided. To enable these features you must install the Tape Monitor Utility and SCSIformat ON-LINE as explained in their respective User's Manuals and switch SW3-5 to ON as shown in Table 3-10. For any operating system other than VMS, this jumper must not be installed.

WARNING **Do not switch SW3-5 to the ON position if the TMU or FMT application software is not installed. The factory setting of SW3-5 is in OFF position (disabled).**

Table 3-10 Tape Monitor Utility and SCSIformat ON-LINE Options

SW3-5	ON	Tape Monitor Utility enabled Disk SCSIformat ON-LINE enabled
SW3-5	OFF	Tape Monitor Utility disabled (F) Disk SCSIformat ON-LINE disabled (F)

Note that (F) means factory setting.

Single-ended or Differential Mode Selection

The CQD-420 SCSI port comes with either single-ended or differential SCSI drivers and receivers. RP1 and RP3 single-ended, active terminators and the single-ended adapter must be installed for single-ended channel. For differential channel, U1 and U2 differential terminators and the differential adapter must be installed. The adapter is configured at the factory for single-ended channel. Figure 3-3 shows single-ended, and Figure 3-4, differential channel configuration.

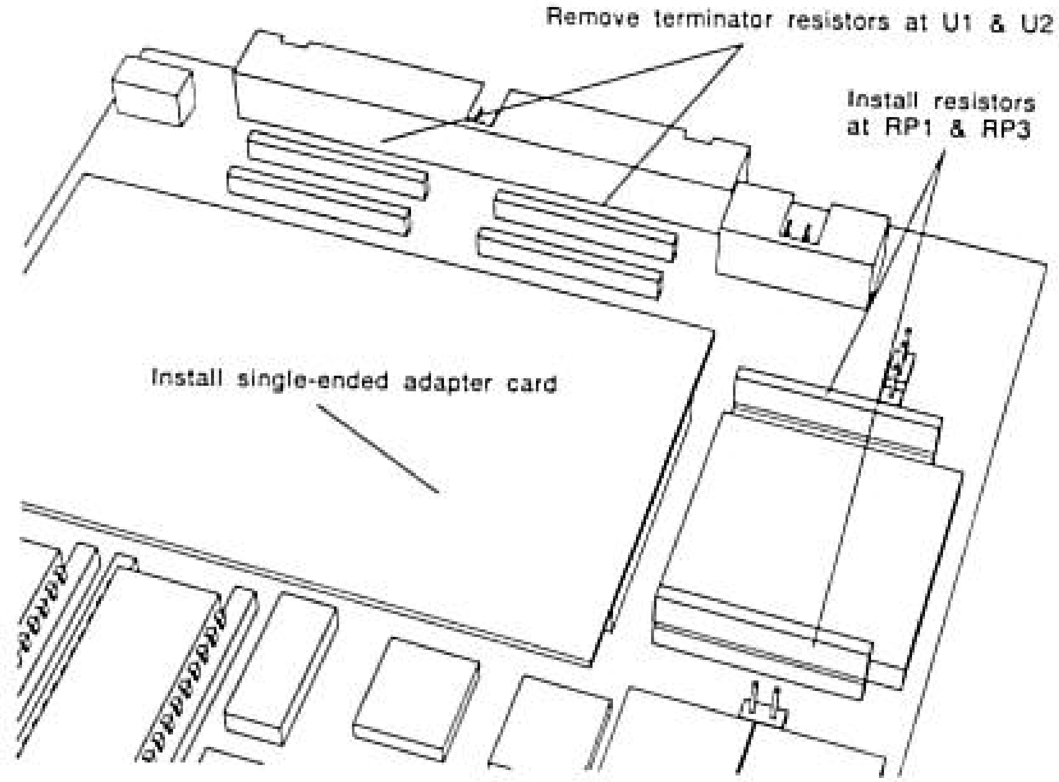

Remove terminator resistors at U1 & U2
Install resistors at RP1 & RP3
Install single-ended adapter card

Figure 3-3: Single-ended Mode Selection

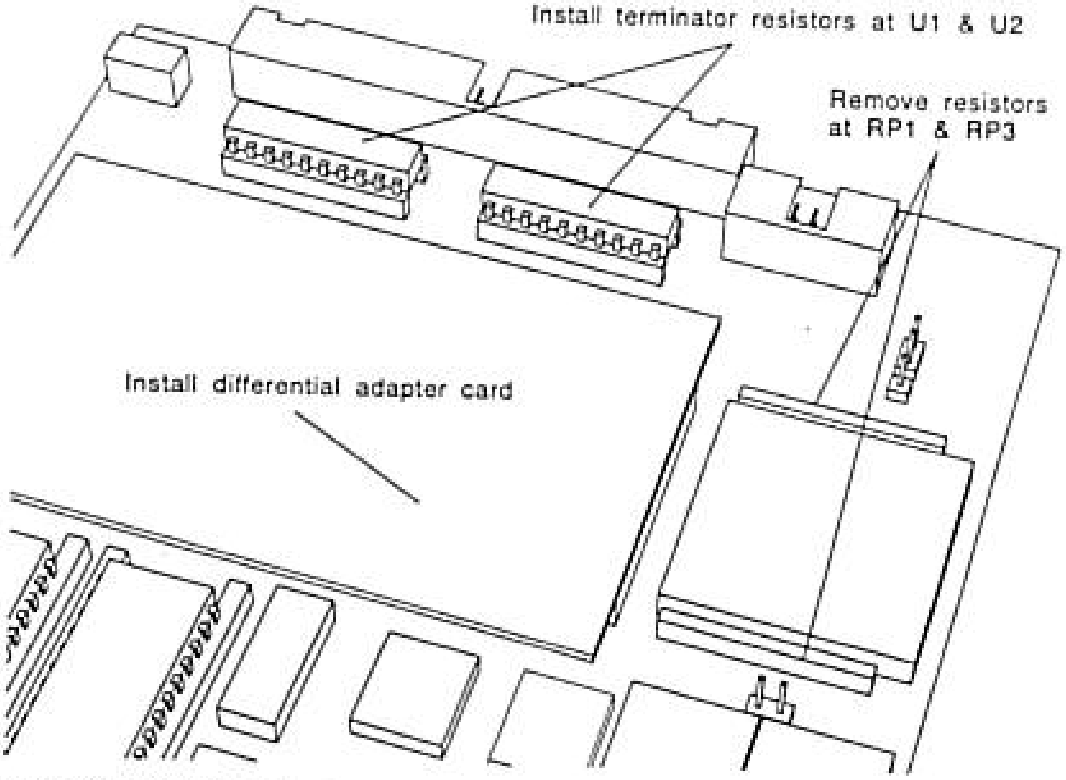

Install terminator resistors at U1 & U2
Remove resistors at RP1 & RP3
Install differential adapter card

Figure 3-4: Differential Mode Selection

Eprom Size

Eprom size is selectable by installing jumper shunt in W4. Table 3-11 illustrates the selection. Eprom size is written on the Eprom.

WARNING **You must select proper jumper setting based on Eprom size; Eprom 256-Kbit is currently shipping; 512-Kbit or 1-Mbit will be used in the future.**

Table 3-11 **Eprom Size Selection**

W4	1-2 IN	Eprom Size 512-Kbit or 1-Mbit
W4	2-3 IN	Eprom 256-Kbit

WARNING **When removing and reinstalling Eproms, align Eproms with IC sockets starting from pin 3. See Figure 3-5.**

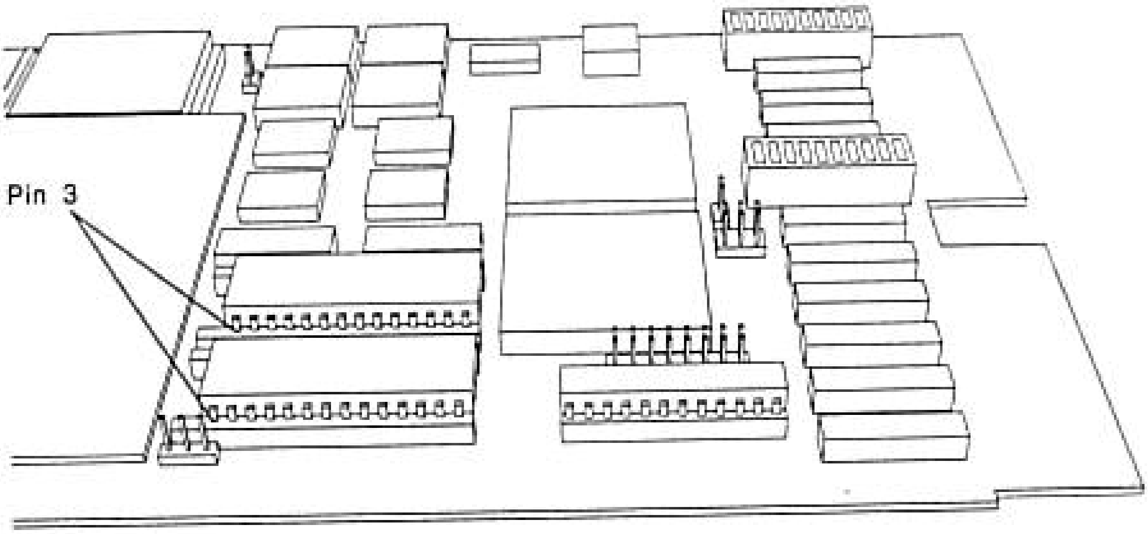


Figure 3-5: Eprom setting

Wait State for Eprom Cycles

Wait state for Eprom cycles can be selected as shown in Table 3-12.

Table 3-12 **Wait State for Eprom Cycles**

W5	OUT	0 Wait State for Eprom Cycles(F)
W5	IN	1 Wait State for Eprom Cycles

Installation

This section gives you instructions for installing the CQD-420 into a system. Remember to turn off the power of the system and SCSI devices while installing the SCSI cable and terminator.

SCSI Host Adapter ID Selection

Each device on the SCSI bus requires a unique SCSI identification address (0-7). SCSI ID 7 has the highest priority on the bus and SCSI ID 0 has the lowest priority. The CQD-420 SCSI Host Adapter is factory configured to SCSI ID 7. Do not change this setting unless you are setting a multi-hosting configuration (see Multi-hosting in Chapter 4).

SCSI ID for Target Devices

Each SCSI device (initiator or target) on the SCSI bus requires a unique SCSI ID number. Since the CQD-420 has been set to SCSI ID 7 (initiator), target devices must be configured from SCSI ID 0 to 6. Table 3-13 shows the SCSI IDs available for the CQD-420/TM model. If you wish to connect more than four disks drives or three tapes drives you *must* use the On-Board Utility (see page 4-22) to change the configuration; otherwise, *do not* change the configuration.

Table 3-13 Device SCSI ID Selection

Model	Device Support	Target SCSI ID
CQD-420/TM	Up to 7 devices combined 4 disk drives and 3 tape drives (F)	Disks—SCSI ID = 0 to 3 (F) Tapes—SCSI ID = 4 to 6 (F)

Note that (F) means factory setting.

CQD-420 Mounting Slot Selection

The CQD-420 can be installed in any slot of the standard MicroVAX or LSI-11 Q-Bus backplane as long as the Q-Bus interrupt acknowledge/DMA grant daisy chain is not broken.

SCSI Bus Cabling

Single-ended—The CQD-420 provides a 50-pin connector (J1) to interface with external single-ended SCSI devices. (The terminators at RP1 and RP3 must be installed along with a single-ended adapter. The differential terminators at U1 and U2 must be removed.)

- When the CQD-420 and the SCSI devices are installed in the same cabinet which meets EMI/RFI shielding requirements, a 25-signal twisted-pair cable must be used for connecting the CQD-420 (J1) and the SCSI devices.
- When the CQD-420 and the SCSI devices are installed in separated cabinets, the shielded SCSI cable should be used to meet FCC requirements.
- A minimum conductor size of 28-AWG must be used to minimize noise effects and ensure proper distribution of optional terminator power.
- The maximum cable length is 6.0-meters or 20-feet in single-ended channel.

Differential—The CQD-420's 50-pin connector (J1) also serves as an interface with external differential SCSI devices. (The single-ended, active terminators at RP1 and RP3 must be removed. The differential terminators at U1 and U2 must be installed along with the differential adapter.)

- When the CQD-420 and the external SCSI devices are installed in the same cabinet which meets EMI/RFI shielding requirements, a 25-signal twisted-pair cable must be used for connecting the CQD-420 (J1) and the external SCSI devices.
- When the CQD-420 and the external SCSI devices are installed in separated cabinets, the shielded SCSI cable should be used to meet FCC requirements. A 25-signal twisted-pair cable must be used to eliminate the crosstalk between adjacent signals causing spurious pulses on differential signals which will occur even at slow data transfer rates and short cable distances. Each pair should be connected to the same signal, one wire to the positive and the other wire to the negative signal.
- Cables should consist of conductors of 26-AWG or 28-AWG.
- The maximum cable length is 25-meters or 80-feet in differential channel.

SCSI Bus Termination

The CQD-420 can be installed in any position of the SCSI cable. If the CQD-420 is installed in either end of SCSI cable, on-board terminators should remain on the board. If the CQD-420 is in the middle of the SCSI bus, on-board terminators should be removed.

Single-ended—The CQD-420 uses active removable terminators for single-ended SCSI. Active termination provides greater noise immunity and more closely matches the cable impedance. The part number for the sips are xxx111 (9 by 110-ohms). They are located in the RP1 and RP3.

Differential—Every differential signal pair should be terminated with 330-ohms resistor between the negative signal and +5-volts, 330-ohms between the positive signal and ground, and 150-ohms between the positive and the negative signal at each end of the SCSI cable. The CQD-420 provides on-board removable terminators (U1 and U2) which are next to the connector J1. RP1 and RP3 single-ended, active terminators must be removed when using differenital channel.

SCSI Bus Terminator Power

Any SCSI terminator (on-drive or external) needs to be powered by at least one SCSI device, otherwise the SCSI signals will be pulled down. Typically an initiator (SCSI host adapter) provides the power to the on-board terminator, external SCSI terminator and on-drive terminator when the drive is powered off. Anytime an external SCSI terminator (instead of the on-drive SCSI terminator) is used, the SCSI terminator power option of the CQD-420 has to be enabled, i.e. install jumper shunt at W2.

A minimum conductor size of 28-AWG shall be employed to minimize noise effects and ensure proper distribution of optional terminator power. The CQD–420's TERMPWR pin is J1, pin 26 for single-ended channel or J1, pins 25 and 26 for differential channel. The CDQ-423's TERMPWR pin is J1, pin 38 for single-ended channel, or J1, pins 13 and 38 for differential channel. Both supply terminator power through a fuse, a diode and jumper block W2 for differential or single-ended (see Table 3-14).

Table 3-14 Terminator Power Option

W2	IN	Single-ended/Differential-ended SCSI terminator power enabled (F)
W2	OUT	Single-ended/Differential-ended SCSI terminator power disabled

Note that (F) means factory setting.

Installation Procedures

1 Determine the CSR address for the CQD-420 as explained in "Determining CSR Address."

WARNING **Be sure to wear anti-static wrist straps or equivalent to protect the CQD-420 from electro-static damage.**

2 Configure the hardware as explained in "Hardware Configuration."

3 Set the CQD-420 and Device SCSI ID's as explained in "SCSI Host Adapter ID Selection" and "SCSI Device ID Selection."

4 Choose a proper slot to place the CQD-420; and install it into that slot (see "CQD-420 Mounting Slot Selection").

5 Connect SCSI cable to J1 for either differential or single-ended configurations using cable specifications given in "SCSI Bus Cabling." The connector will be non-shielded for the CQD-420.

WARNING **In order to prevent accidental grounding or misconnection of terminator power, make sure that the pin 1 mark of SCSI cable matches with the pin 1 mark of SCSI device's connector before turning on the power.**

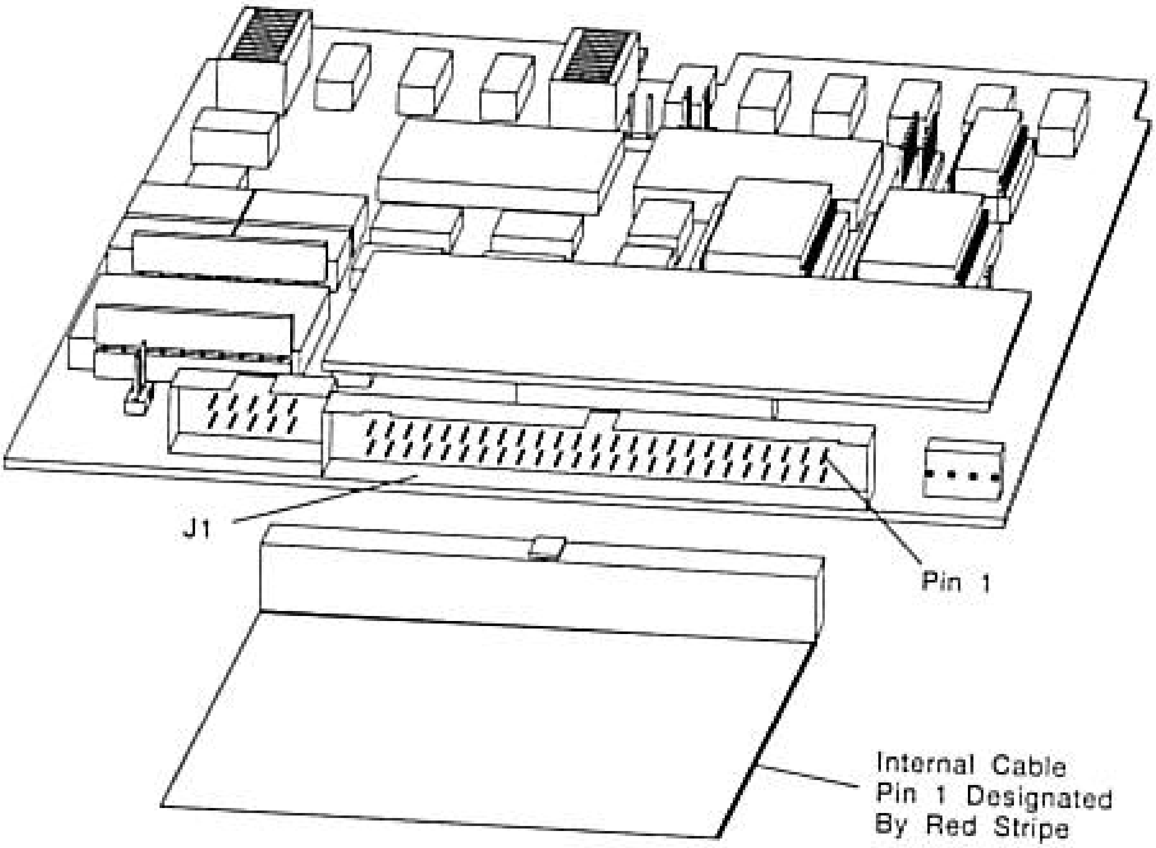


Figure 3-6: CQD-420 non-shielded cable connection

For the CQD-423, the connector will be shielded, see Figure 3-7.

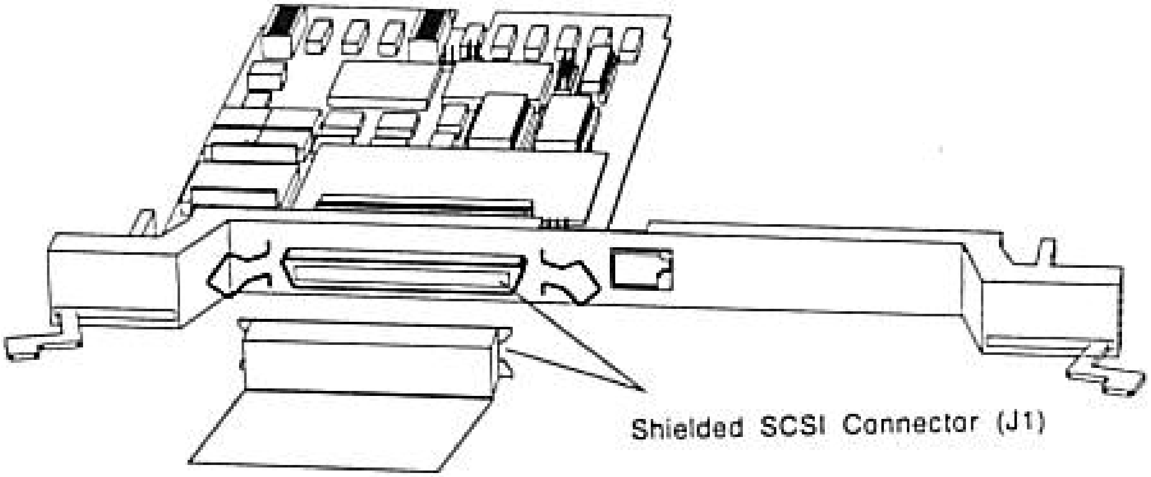


Figure 3-7: CQD-423 shielded connection

6 Continue SCSI cabling to connect up to seven SCSI devices to the CQD-420. See the example in Figure 3-8.

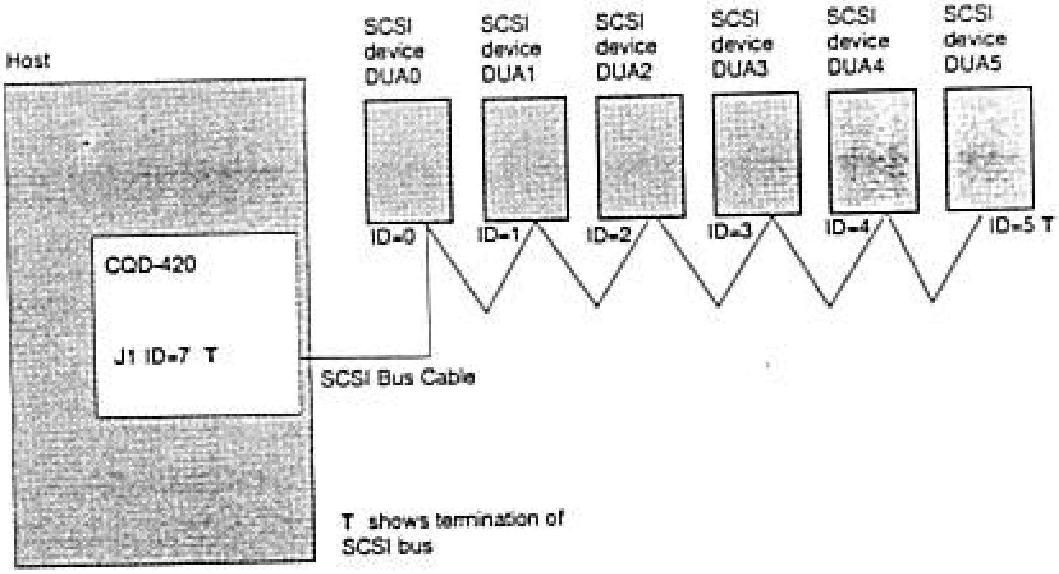


Figure 3-8: SCSI ID and Cabling

7 Terminate the SCSI bus at each *physical* end; see "SCSI Bus Termination." If the CQD-420 is installed in either end of SCSI cable, on-board terminators should remain on the board. If the CQD-420 is in the middle of the SCSI bus, on-board terminators should be removed. If TERMPWR

is needed for the bus, place jumper shunt on W2 as explained in "SCSI Bus Terminator Power" (see the example in Figure 3-8).

8 Power up the system and execute On-Board Utility to scan for the SCSI devices and assure that all devices are seen and functioning properly (see Chapter 4 for On-Board Utility).

9 Boot the system and test with the operating system.

4

Setup

This chapter will assist you in setting up the CQD-420 and your system

On-Board Utility

The CQD-420 SCSI host adapter comes with a general purpose On-Board Utility for all systems. The On-Board Utility can test the system slot, SCSI cable, and SCSI devices connected to the CQD-420. Accessing the Utility can be done through LSI or VAX system or the RS-232 Port. Be sure to complete utility functions, explained at the end of this chapter.

Accessing the Utility Through the LSI or VAX System

The On-Board Utility Program can be accessed by means of an ODT command for LSI and VAX systems. One example is shown with the SCSI host adapter set to the first disk CSR address. Because the formats and features of the On-Board Utilities for LSI-11 systems and MicroVAX systems are similar (except different start up procedures), the MicroVAX utility will be described.

Instructions for using the Disk Utility with LSI-11 Systems are listed below:

1. Halt the processor.
2. Hit the Boot Switch.
3. Enter the CSR address plus 2 (in Octal), a slash, and `123456`. For example, for CSR address 17772150 enter: `17772152/005400 123456`. CSR addresses can be found in Chapter 3 or Appendix C.

4. Enter CSR address plus 2 (in Octal), a slash, and `100` to load the utility to the system memory. For example, for CSR address 17772150 enter:
   `17772152/001000 100.`

5. Enter `5000G`. The Utility program will begin executing.

EXAMPLE For steps 3 to 5 with CSR 17772150, enter the following:

```
772152/005400 123456 [ENTER]
772152/ 100  [ENTER]
5000G  [ENTER]
```

Instructions for using this utility with VAX Systems are listed below:

1. Halt the CPU.

2. At the prompt >>> enter `U` to unlock the CPU.

3. At the prompt >>> enter `I` to initialize the CPU.

4. At the prompt >>> enter `D/P/W  20001F40  20` to enable Q-bus memory access.

5. At the prompt >>> enter `D/L  20088008  80000002` to set up Q-bus map.

6. At the prompt >>> enter `D/W  YYYYYYYY  A72E` to deposit to the base CSR address plus 2 (in Hex). CSR addresses can be found in Chapter 3 or Appendix C.

   Where
   `YYYYYYYY`—the CSR address plus 2 (in Hex). See Table 4-1 for disk and Table 4-2 for tape.

Table 4-1 Disk CSR Addresses Plus 2 Configurations

CSR Reference	CSR Addresses	CSR Addresses Plus 2: *YYYYYYYY*
772150	20001468	2000146A
760334	200000DC	200000DE
760354	200000EC	200000EE
760374	200000FC	200000FE
760340	200000E0	200000E2
760344	200000E4	200000E6
760350	200000E8	200000EA
760360	200000F0	200000F2

Table 4-2 Tape CSR Addresses Plus 2 Configurations

CSR Reference	CSR Addresses	CSR Addresses Plus 2: *YYYYYYYY*
774500	20001940	20001942
760404	20000104	20000106
760444	20000124	20000126
760504	20000144	20000146
760544	20000164	20000166
760410	20000108	2000010A
760450	20000128	2000012A
760454	2000012C	2000012E

7 At the prompt >>> enter `D • 100` to load the utility to system memory. This command deposits 100 to current address.

8 At the prompt >>> enter `S 400` to start the utility.

EXAMPLE For steps 2 and 8, enter:

```
U      [ENTER]
I         [ENTER]
D/P/W   20001F40   20          [ENTER]
D/L   20088008   80000002          [ENTER]
D/W   YYYYYYYY   A72E   [ENTER] (YYYYYYYY - CSR +2)
D   *   100    [ENTER]
S    400
```

The utility will display as follows:

```
SCSI UTILITY PROGRAM
DISK                          TAPE
1 - 772150                    A = 760400
2 - 760334                    B = 760404
3 - 760354                    C = 760444
4 - 760374                    D = 760504
5 - 760340                    E = 760544
6 - 760344                    F = 760410
7 - 760350                    G = 760450
8 - 760360                    H = 760454

SELECT CSR ADDRESS
```

9 Enter the corresponding CSR address for the CQD-420. If the CQD-420 is running on a LSI-11 system, the following Main Menu will appear. Otherwise, the first screen will be as shown on page 4-6.

```
MAIN MENU                                  CSR=772150 (20001468)

1 = BOOT DEVICE
7 = ADDITIONAL SCSI COMMANDS

SELECT OPTION:
```

NOTE LSI systems will display this Main Menu differently as item 1 = Boot Drive. If the message `CONTROLLER NOT PRESENT` appears, make sure CSR address is correct.

10 From the Main Menu only select option *1* or *7*. *1* will halt the system and *7* will bring you to the SCSI Host Adapter Utility.

Accessing the Utility Through the RS-232 Port

To access the utility from the RS-232 port, follow the instructions below.

1 Connect a terminal to the CQD-420's RS-232 port (10 pin connector) or to the CQD-423's RS-232 port (DEC compatible RJ-11/Modified Module 423 Jack connector). See Figures 4-1 and 3-3.

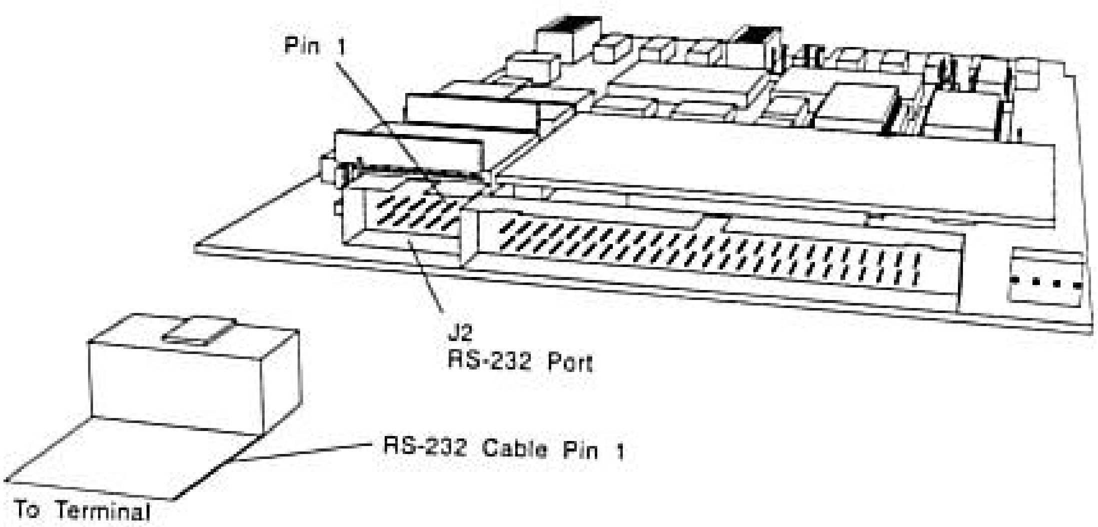


Figure 4-1: CQD-420 RS-232 Port

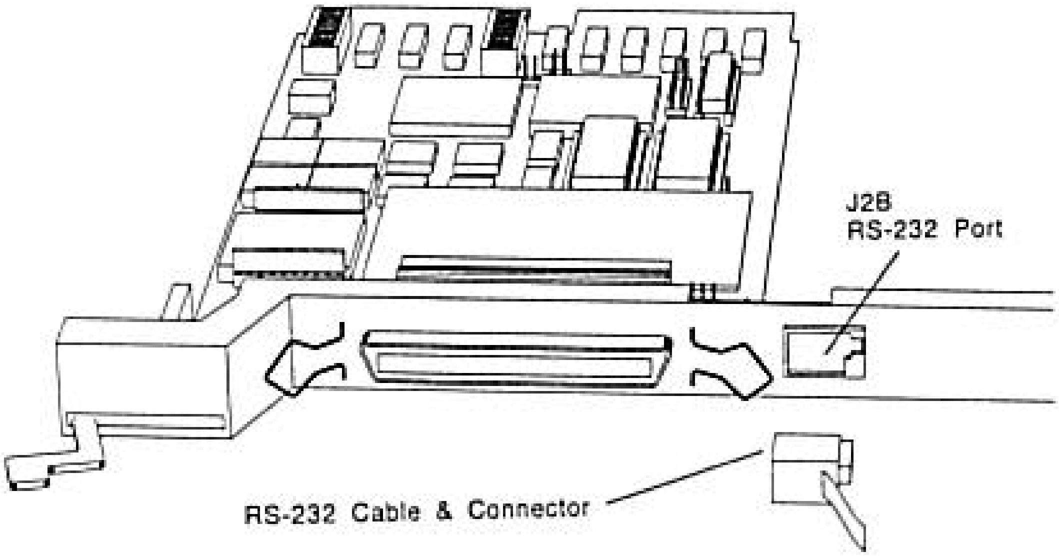


Figure 4-2: CQD-423 RS-232 Port

2 Set the terminal baud rate to 9600 (8-bit data, 1-stop bit, no parity) jump scroll.

3 Halt the system's CPU, reset the system, and hit carriage return on the terminal. The SCSI Host Adapter Utility will display as follows:

```
SCSI HOST ADAPTER UTILITY (REV. YYYxZZ)

X - UTILITY EXIT
D - DIAGNOSTIC TEST

[DISK]                                  [TAPE]
1 - LOGICAL UNIT NUMBER OFFSET          6 - LOGICAL UNIT NUMBER OFFSET
2 - FORMAT DRIVE                        7 - ADDITIONAL UTILITIES
3 - QUALIFY DRIVE
4 - MANUALLY REPLACE BAD BLOCKS
5 - ADDITIONAL UTILITIES

SELECT OPTION ?
```

Once the SCSI Host Adapter Utility shows up, you may key in the appropriate letter or number to select the desired option. Press [CTRL] + C at any time to return to the main menu.

4 Refer to the next subsections for configurations. When completed, unplug the terminal, reset the system, and boot. DO NOT use the On-Board Utility while the system is running.

Running the Diagnostic Test

Before running the diagnostic test, you must initialize the memory map. The following commands, entered at the console prompt, will initialize the memory map.

```
>>> u
>>> i
>>> d/p/w 20001f40 20
>>> d/l 20088000 80000000
```

If you do not initialize the memory map before running the diagnostic test, the CQD-420 will report failures on each test that accesses Q-bus memory.

The FIFO test will be skipped if you run the diagnostic on a disk that does not have a read/write buffer.

The diagnostic test requires the use of a disk drive as a data disk. The test will not affect any data on the disk, since only SCSI Read/Write Buffer commands are used. Data is read from and written to the drive buffer rather than the disk platter.

Select option "D" from the Main Menu and respond to the prompts to begin the diagnostic test. The following is an example of diagnostic test session.

```
ENTER DEVICE NUMBER OF DATA DISK
DEVICE NUMBER? DEV (0 - 6) DEV 0
PLEASE WAIT, CHECKING DEVICE CONFIGURATION -
READY TO START DIAGNOSTIC TEST, PRESS ANY KEY TO START.
CPU TEST                                                    PASSED
SRAM TEST                                                   PASSED
NON-VOLATILE RAM TEST(30 SECONDS)                           PASSED
EPROM TEST                                                  PASSED
FIFO TEST                                                   PASSED
SCSI CHIP INTERRUPT TEST                                    PASSED
SCSI TO DRIVE HANDSHAKE TEST#1                              PASSED
SCSI TO DRIVE READ/WRITE THROUGH FIFO TEST#1                PASSED
SCSI TO DRIVE HANDSHAKE TEST#2                              PASSED
SCSI TO DRIVE READ/WRITE THROUGH FIFO TEST#2                PASSED
QBUS BUS CONTROLLER TEST#1                                  PASSED
QBUS BUS CONTROLLER TEST#2                                  PASSED
QBUS BUS CONTROLLER TEST#3                                  PASSED
QBUS SINGLE WORD DMA TEST                                   PASSED
QBUS TO FIFO DMA TEST                                       PASSED
QBUS TO SCSI READ/WRITE THROUGH FIFO TEST                   PASSED
TEST COMPLETED. PRESS ANY KEY TO CONTINUE.
```

If the drive-related tests show failures, make sure that the drive is connected and mounted properly. If you get a FIFO test failure, the problem simply may be that the drive does not have buffered I/O. Failures on the Q-bus controller tests could be a result of a failure to initialize the memory map before running the test.

Changing LUN Offset

When a system has a HSC or in a VAX cluster it will be necessary to change the LUN (Logical Unit Number) offset. Each MSCP drive requires a different Unit Number so that the unit numbers are not duplicated. If there are no other MSCP controllers in the system, the LUN offset can be 0.

If there exists another MSCP controller with four drives (0 to 3) in a VAX cluster configuration, then the LUN offset should be four or above. In the case that LUN offset is equal to 10, SCSI ID 0 will be DUB10 and SCSI ID 1 will be DUB11. The drives will show up as such DUA0, DUA1, DUA2, DUA3, DUB10, DUB11 (see section, "SCSI ID for Target Drives" in Chapter 3 for explanation). Follow these procedures to configure LUN offset.

1. Select option *1* from the SCSI Host Adapter Utility for disk drives; *6* for tape drives.

2. Enter the new value for LUN offset at the statement:
   ```
   LUN OFFSET IS 0. ENTER NEW VALUE:
   ```

3 At the statement: `SAVE NEW VALUE (Y or N)?` enter Y.

4 The monitor will display `FORMAT COMPLETE` when finished executing.

Formatting the Drive

This section details formatting a drive. The CQD-420 issues Format Unit Command to the selected SCSI disk drive and requests it to map out the defects on the Manufacture Defect List (MDL). Remember formatting a drive will rewrite all the sectors of that drive.

All SCSI drives are preformatted at the factory. It is not necessary to format a new drive. If you wish to format a drive, follow the steps below:

1 Select option 2 from the SCSI Host Adapter Utility.

2 Enter the device number from 0 to 6 in the statement:
`DEVICE NUMBER? <0 TO 6> DEV X.`

3 Answer *Y* to the question `FORMAT DRIVE X. ARE YOU SURE?` if you want to continue.

4 At the statement: `WARNING DATA WILL BE DESTROYED. ARE YOU SURE?` enter *Y* if you want to continue.

5 The monitor displays `WAIT` while the drive is executing the format process.

6 The monitor will display `COMPLETE` when finished executing.

Qualifying the Drive

After formatting the device, CMD recommends you qualify devices by running this procedure at lease once without errors detected. The qualify program writes different patterns to the drive and then verifies the data. If there are any bad sectors, the sectors will automatically be replaced and the statement `XX XXXXXXXX BAD BLOCK REPLACED` will appear. Follow the instructions below for qualifying a drive.

1 Select option 3 from the SCSI Host Adapter Utility.

2 Enter the device number at the statement: `DEVICE NUMBER? DEV <0 TO 6> DEV X.`

3 At the statement, `READY TO TEST DEVICE X. ARE YOU SURE?` enter Y if you want to continue.

4 At the statement: `*** WILL DESTROY DATA ON THIS DEVICE. ARE YOU SURE?` enter Y if you want to continue.

5 The monitor will display `QUALIFY STARTED <SEQUENTIAL WRITE & READ>! <HIT <Break> TO ABORT>`.

6 The monitor will display `TESTING LOOP COUNT & BLOCK NUMBER:`

7 Press [BREAK] to exit back to the SCSI Host Adapter Utility after you are satisfied with the qualifying process.

Manually Replacing Bad Sectors

This option allows you to replace bad sectors manually. The controller supports dynamic defect management which replaces defective sectors on-line so there is no need to manually replace bad sectors. However, if you wish to replace bad sectors manually follow these instructions; remember that any data in the sector will be lost:

1 Select option 4 from the SCSI Host Adapter Utility.

2 Enter the device number at the statement:

```
DEVICE NUMBER ? DEV  <0 TO 6> DEV X:
```

3 Enter the logical block number in HEX at the statement:

```
READY TO TEST DEVICE X.
ENTER THE BAD BLOCK NUMBER <HEX> : xxxxx
```

4 The monitor will display `-BAD BLOCK REPLACED-` when finished executing.

Additional Utilities

To access additional utilities for disk drives, select option 5 from the main menu. To access additional utilities for tape drives, select option 7 from the main menu. The additional utilities menu will display as follows:

```
ADDITIONAL UTILITIES          (REV. YYYxZZ)       SN = 1278

D - DISPLAY SCSI DEVICE AND SET UP CONFIGURATION
S - SEND SCSI COMMAND TO THE DEVICE
T = TEST SCSI DEVICE
R = FORMAT RCT BLOCK

SELECT OPTION ?
```

Displaying SCSI Device and Setting Up Configuration

Selection 'D' can be used to change the controller default configurations such as those listed below:

- reset to default
- number of disk and tape devices supported
- SCSI reset enable/disable
- SCSI disconnect enable/disable
- sync/async mode selection
- tape buffer mode enable/disable
- prevent medium removal enable/disable
- disk write with verify enable/disable
- remote density mode enable/disable
- default tape enable/disable
- reconfigure device
- autoboot start from floppy enable/disable
- write protect from controller jumper setting
- truncate disk size for volume shadowing
- eject removable disk cartridge after dismount
- enable or disable tag queuing

This utility can also scan/display the SCSI devices attached to the CQD-420. The CQD-420/TM will be shown as an example in the following display. To display SCSI devices and set up configuration follow the procedures below.

1 Select option *D* at the sub-menu (see page 4-11), the following current configuration is displayed:

```
DEV0:   DU0 SCSI ID 0 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV1:   DU1 SCSI ID 1 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV2:   DU2 SCSI ID 2 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV3:   DU3 SCSI ID 3 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV4:   MU0 SCSI ID 4 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV5:   MU1 SCSI ID 5 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV6:   MU2 SCSI ID 6 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV7    SCSI ID 7 HOST ADAPTER. SCSI Reset OFF,Density Mode OFF,Default Tape OFF.
        Rew/Im OFF,Eject Disk ON,Truncate Size OFF,RCT size= OFF,RA dev= DEF.
        Rsv/Rls Option ON,MSCP credit = 16,sync rate = 04 MB/sec.
        RSX FP OFF,Sel Timeout = 250 ms
        (PMR=Prevent Medium Removal WWV=Write W/Verify)
```

NOTE If Truncate Size is toggled on, "Truncate Mode ON" will display under each disk device options and at the bottom when configuration is displayed.

2 To change the configuration, enter Y at the statement: `CHANGE CONFIGURATION ? (Y/N)`. The following menu will appear.

NOTE See subsection, "Unit Numbering for Devices" on page 4-21 before trying to reconfigure devices.

```
R = Toggle SCSI Reset             M - Toggle Density Mode
D - Toggle Disconnect             B - Toggle Buffer/Truncate Mode
S - Toggle Sync/Async             W - Toggle Density/Write Verify Mode
C - Reconfigure Device            P = Toggle Prevent Medium Removal
A - Set the RA number             1 = Toggle device RA
E - Eject after Dismount          2 = Toggle device RCT
G - Toggle RSX w/floppy
J - Change Selection Timeout Period
K - Toggle Host/Target Queue Mode
L - Reserve/Release Disk
Q - Allow Rewind w/No-Wait
T = Reset All Device
U - Toggle Default Tape
V = Truncate for Volume Shadowing
Y - Set the RCT size
Z - Reset Controller
( Hit <return> key to exit )

SELECT OPTION ?
```

The following list is an explanation of the selections in the configuration menu.

R = Toggle SCSI reset—If SCSI reset is enabled, a reset to the SCSI bus will be issued on power up. This should be turned off when multi-hosting is desired.

D = Toggle Disconnect—This option allows you to enable or disable disconnect for each device. If enabled the controller will indicate its ability to disconnect during the SCSI identify message.

S = Toggle Sync/Async—This option allows you to configure each device for synchronous or asynchronous operations. If synchronous is selected, the controller will attempt a synchronous handshake with the device. If the device accepts the message exchange, they will transfer data synchronously, otherwise they will transfer asynchronously.

C = Reconfigure Device—This option allows you to reconfigure the device at any time.

A = Set the RA number—This option allows you to set the media type that the adapter reports to the operating system. This parameter applies to all devices with "RA ON." Toggle RA between ON and OFF with option 1 on the configuration menu. The adapter supports the following device types: RA70, RA80, RA81, RA82, RA90 and RA92. When RA is toggled OFF, the adapter automatically selects a device type from this list that most closely matches—but is not less than—the device's capacity. If you want to force the adapter to report a specific RA device type, select "A" and enter either 70, 80, 81, 82, 90 or 92. Then toggle RA ON for any devices that you want to be reported as that device type. You may not select different RA device types for different drives. The RA device type you select with option "A" will apply to all devices with RA toggled ON.

For example, to make device 3 report as an RA92 device, select "A" from the configuration parameters menu...

```
Enter the RA number (70,80,81,82,90,92) >92

DEV0:   DU0 SCSI ID 0 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV1:   DU1 SCSI ID 1 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV2:   DU2 SCSI ID 2 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV3:   DU3 SCSI ID 3 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV4:   MU0 SCSI ID 4 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV5:   MU1 SCSI ID 5 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV6:   MU2 SCSI ID 6 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV7    SCSI ID 7 HOST ADAPTER. SCSI Reset OFF,Density Mode OFF,Default Tape OFF.
        Rew/Im OFF,Eject Disk ON,Truncate Size OFF,RCT size= OFF,RA dev= 92.
        Rsv/Rls Option ON,MSCP credit = 16,sync rate = 04 MB/sec.
        RSX FP OFF,Sel Timeout = 250 ms
        (PMR=Prevent Medium Removal WWV=Write W/Verify)

CHANGE CONFIGURATION ? (Y/N) Y


 R = Toggle SCSI Reset            M = Toggle Density Mode
 D = Toggle Disconnect            B = Toggle Buffer/Truncate Mode
 S = Toggle Sync/Async            W = Toggle Density/Write Verify Mode
 C = Reconfigure Device           P = Toggle Prevent Medium Removal
 A = Set the RA number            1 = Toggle device RA
 E = Eject after Dismount         2 = Toggle device RCT
 G = Toggle RSX w/floppy
 J = Change Selection Timeout Period
 K = Toggle Host/Target Queue Mode
 L = Reserve/Release Disk
 Q = Allow Rewind w/No-Wait
 T = Reset All Device
 U = Toggle Default Tape
 V = Truncate for Volume Shadowing
 Y = Set the RCT size
 Z = Reset Controller
 ( Hit <return> key to exit )

 SELECT OPTION ? 1
 DEVICE NUMBER? DEV (0 - 6) DEV 3
```

```
DEV0:   DU0 SCSI ID 0 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV1:   DU1 SCSI ID 1 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV2:   DU2 SCSI ID 2 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV3:   DU3 SCSI ID 3 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA ON.
DEV4:   MU0 SCSI ID 4 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV5:   MU1 SCSI ID 5 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV6:   MU2 SCSI ID 6 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV7    SCSI ID 7 HOST ADAPTER. SCSI Reset OFF,Density Mode OFF,Default Tape OFF.
        Rew/Im OFF,Eject Disk ON,Truncate Size OFF,RCT size= OFF,RA dev= 92.
        Rsv/Rls Option ON,MSCP credit = 16,sync rate = 04 MB/sec.
        RSX FP OFF,Sel Timeout = 250 ms
        (PMR=Prevent Medium Removal WWV=Write W/Verify)

CHANGE CONFIGURATION ? (Y/N) Y
```

As the preceding example shows, the resulting configuration display shows that for DEV 7, the RA dev parameter is 92, and for DEV 3, RA is toggled on.

E = Eject Disk after Dismount—This option allows you to specify whether the removable disk cartridges will eject from the drive after dismount.

G = Toggle RSX w/floppy—Toggle this option on when you are running the CQD-420 with an operating system that does not support MSCP attention. This will allow you to change floppies. The default setting for this option is off.

J = Change Selection Timeout Period—This option allows you to enter a faster selection timeout period for the SCSI bus. The default and maximum value is 250 milliseconds. This is also the SCSI standard. Some devices are able to respond in less time, in which case it is advantageous to enter a shorter timeout period for the bus. All devices on the bus must be support the new timeout period, however. When you select this option, you will be prompted for a new timeout value from 1 to 250 msec. You will prompted once again to save or reject the new value.

K = Toggle Host/Target Queue Mode—This option allows you to toggle tag queuing on or off for a particular device that supports tag queuing. When you select this option, you will be prompted for a device number. The only valid device numbers will be for disk drives. Disable tag queuing in multiple-host configurations.

L = Reserve/Release Disk Option—This option is to let the MSCP ON-LINE exclusive use modifier to be operable.

Q = Allow Rewind w/No-Wait—Turn this option OFF if you are using an operating system that uses REWIND IMMEDIATE and have a tape device that does not support this command correctly. For example, if you are using the RSX operating system and a DEC TZ30 tape device, you should turn this option OFF.

T = Reset All Device—These modes are—disconnect, synchronous, Prevent Medium Removal, Write with Verify, and Buffer modes.

U = Toggle Default Tape—This option allows you to force the presence of a tape unit to the operating system even if one does not exist. This is needed for some operating systems when the controller is connected to devices with a long self test procedure after power-up. If it is disabled, only units connected to the controller are seen by the operating system.

V = Truncate for Volume Shadowing—This option allows the size of the disk to be truncated to multiples of 126 blocks to allow VMS volume shadowing copy process to reach higher performance. The message `** WARNING ** Truncate Size ON/OFF will be toggled. Are you sure?` will display before truncate switch can be toggled. If this feature is used on a disk that contains valid data, the data must be removed and later restored after turning this feature ON. Use option "B" to toggle individual devices.

Y = Set the RCT size—This option is included for the purpose of compatibility with other vendors' controllers. It permits the user to adjust the CQD-420'a RCT (replacement caching table) so that the total number of blocks on a disk device available to the CQD-420 matches the total number of blocks expected by other controllers. You may apply whatever RCT size you set to specific devices by selecting option "2." The maximum value for this option is 255.

Z = Reset Controller—This option allows you to set the controller to its factory default configuration. This will set the CQD-420/TM to support four disk drives and three tape drives; disconnect, SCSI reset, synchronous communication, buffer mode, prevent medium removal and density selection; write with verify, write protect disabled, reserve/release disk disabled, and default tape disabled. ALWAYS use this feature before you reconfigure the board.

M = Toggle Density Mode—This option allows you to configure the controller for remote density selection. If enabled, remote density selection may take place. If enabled, the controller reports itself as a 'TU81.' If disabled, it reports itself as a 'TK50.'

B = Toggle Buffer/Truncate Mode—For tape devices, this option allows the controller to configure each individual tape device for write caching. If enabled, the tape device will send command complete message and good status to the controller once the data as been transferred to the tape device's internal buffers. If disabled, such message and status will be sent when the data is actually written to the tape.

W = Toggle Density/Write Verify Mode—For tape devices, this option toggles tri-density on an off. The CQD-420 supports all three VMS densities. If your tape drive supports tri-density, you should turn tri-density on. The CQD-420 supports most, but not all, tri-density drives. For disk devices, this option will allow the SCSI command Write with Verify to be issued for MSCP write with verify modifier. When set to OFF (which is the default), the normal write command will be issued.

P = Prevent Medium Removal—This option is for removable disk drives only. When set to ON, a "Prevent Medium Removal" will be issued to a drive when it is mounted by VMS. This will disable the eject media push-button in front of the drive. An "Allow Medium Removal" will be issued when the drive is dismounted by VMS and the push-button will be enabled. This features can be disabled and the media can be ejected at anytime.

1 = Toggle device RA—After you have set the RA number for the controller with option "A," use this option to apply or remove this parameter for a particular device. Whatever RA number you set with option "A" will apply to all devices that you toggle ON with option "1."

2 = Toggle device RCT—After you have set the RCT size for the controller with option "Y," use this option to apply or remove this parameter for a particular device. Whatever RCT size you set with option "Y" will apply to all devices that you toggle ON with option "2."

3 To reconfigure the device select option C and the screen will display the following prompt:

```
Enter MSCP credit limit
1 = 32 credits
2 = 16 credits
Enter
```

MSCP credit is the number of MSCP commands the host will be allowed to send to the controller at one time. Enter the MSCP credit limit desired, either 1 for 32 credits or 2 for 16.

4 The screen will display the following prompt:

```
Enter Synchronous transfer rate (MB/sec)
Enter (4-10) ?
```

WARNING Use homogeneous high quality twisted pair cables within SCSI specifications for specified transfer rate.

5 Enter synchronous rate from 4 to 10-MB/sec. The screen will prompt you to answer the next series of questions:

```
Number of Disks? (0-7)  4
   DU0 to be Reconfigured? (Y/N) N
   DU1 to be Reconfigured? (Y/N) N
   DU2 to be Reconfigured? (Y/N) N
   DU3 to be Reconfigured? (Y/N) N
Number of Tapes? (0-3)  3
   MU0 to be Reconfigured? (Y/N) N
   MU1 to be Reconfigured? (Y/N) N
   MU2 to be Reconfigured? (Y/N) N
```

6 Enter the number of disk and/or tapes. Default configuration is four disks, and three tapes; it is not necessary to configure if running less than four disks and three tapes.

NOTE If zero is selected for the number of disks or tapes disable the corresponding CSR address as shown in Table 3-1 to Table 3-4. Do not use 0 disk and/or 0 tape configuration in the above setup.

Answer *Y* or *N* to reconfigure each of the disks or tapes. If you answer *Y*, the screen will prompt you with these questions:

```
DUX SCSI ID? <0-7>
DUX LUN? <0-3>
```

NOTE This LUN is SCSI LUN; it is normally 0. This is used only for devices that support multiple LUNs.

7 When you have completed these instructions the display will show your current configuration and prompt you again with the question `CHANGE CONFIGURATION ? (Y/N)`. Enter *N*; this will cause the CQD-420 to scan the SCSI bus.

The utility will display your current configuration with manufacturer's name, model number, and firmware revisions for each device. Record this information for future use.

Sending SCSI Commands To The Device

Selection 'S' can be used to send SCSI commands to the selected disk/tape drives directly.

This option is used to send a 6-, 10-, or 12-byte command to a SCSI device. Follow these procedures to send SCSI commands to the device:

1 Enter *S* from the "Additional Utilities" Menu. (Be sure you have correctly selected either *5* from the SCSI Host Adapter Utility for disk drives, or *7* for tape drives.)

2 At the question `DEVICE NUMBER ? DEV <0-6> DEV` enter the device number.

3 Enter the command sequence at the statement:

```
READY TO TEST DEVICE X
EDIT CDB <HEX>   ***<ESC> TO TERMINATE EDITING***
BYTE    0000= 00
```

If a 6- or 10-byte command is used, press [ESC] to terminate command editing. If a 12-byte command is used, command editing is terminated automatically.

4 At the statement `WRITE DATA TO THE DEVICE ? <Y OR N>` enter *N* to immediately send the command if SCSI command does not require a data out phase.

Or enter *Y* to send data to the device after the command phase if SCSI command requires a data out phase. Enter the data and enter [ESC] to terminate editing. The statement `SAVE EDITED DATA IN BUFFER ? <Y OR N>` will appear. Enter

Y to save data in the buffer; or enter *N* to erase edited data after the command is sent.

Testing SCSI Device

Selection 'T' can be used to read only, write and read selected disk drive, and/or write and read selected tape drive continuously. This is a diagnostic tool to help with installation and testing. Follow the procedures below to test the SCSI device.

1 Enter *T* from the "Additional Utilities" menu. (Be sure you have correctly selected either *5* from the SCSI Host Adapter Utility for disk drives, or *7* for tape drives.)

2 At the question `DEVICE NUMBER ? DEV <0-6> DEV` enter the device number.

3 When testing for *disk devices*, at the statement `READY TO TEST DEVICE X, DO YOU WANT TO READ ONLY ? <Y OR N>` enter *Y* to read only.

Enter *N* to write and read. The question `ARE YOU SURE?` will display. Enter *Y* to write and read to the device.

WARNING *N* will destroy all data on the device.

When testing for *tape devices*, the statement `ARE YOU SURE?` will display. Enter *Y* to test the device.

4 At the statement, `IS THIS FOR DUAL HOSTS QUALIFICATION TEST? <Y/N>`, enter *Y*. Enter *N* for single host qualification. The test will continue until you abort. Allow the test to continue for a few minutes for new devices and ten minutes for suspected bad devices. Press [BREAK] or [CTRL] + C to abort and exit back to the SCSI Host Adapter Utility.

Formatting RCT Block

Selection 'R' can be used to format the RCT blocks of the disk drive selected. This command writes zeros in the last logical block of the device. If you try to skip the formatting process and directly use the drive, you *must* use this option to eliminate "unrecoverable bad RCT block." However, CMD recommends you format the drive. To format the RCT block follow these instructions:

1 Select *R* from the "Additional Utilities." (Be sure you have previously selected *5* from the SCSI Host Adapter Utility for disk drives.)

2 Enter device number at the statement: `DEVICE NUMBER? DEV <0-6> DEV.`

If device is off-line the following statement will appear, `DEVICE OFFLINE, RESELECT OR PROCEED ? (R/P)`. Enter *R* to reselect or *P* to proceed.

3 `FORMAT COMPLETE` will display when RCT block has been formatted.

Completing Utility Functions

The following procedures should be completed when you have accessed the On-Board Utility through the RS-232 port.

1 Use the On-Board Utility to verify SCSI cable and SCSI devices connected to the CQD-420 after installing the CQD-420 in the Q-bus slot.

2 After verifying the SCSI connections, disconnect RS-232 cable from the back panel, and reset the system.

NOTE If the terminal is connected, this may cause the On-Board Utility to be invoked during system operation and will take control of the Host Adapter from VMS.

The following procedures should be completed when you have accessed the On-Board Utility through the Virtual Console of the LSI or VAX systems.

1 Use the On-Board Utility to verify the Q-bus slot seating, SCSI cable, and SCSI devices connected to the CQD-420 after installing the CQD-420 in the Q-bus slot.

2 After verifying the SCSI connections, reset the system.

Unit Numbering For Devices

This section explains configuring unit numbers. Unit numbers may be changed by using the "Configure LUN Offset" from the main menu. If you used the 'D' option from the "Additional Utilities" menu, the terminal will display the *MU* and/or *DU* numbers as shown in Table 4-3, factory default settings for unit numbers.

Table 4-3 Default for Unit Numbers

CQD-420/TM	SCSI ID	On-Board Utility	O/S Unit No.
	0	DU0	0
	1	DU1	1
	2	DU2	2
	3	DU3	3
	4	MU0	0
	5	MU1	1
	6	MU2	2

An example below is given for each type of controller to show how the unit numbers can be determined. Refer to the current configuration display example on page 4-12 if necessary.

CQD-420/TM—Default is four disk drives and three tape as shown in Table 4-3. If you have more than four disk drives or three tape drives, follow these guidelines—disk drives must start at SCSI ID 0 and tape drives must start after the last disk drive's SCSI ID number and reconfigure the CQD-420/TM (see subsection, "Displaying SCSI Devices and Setting Up Configuration"). Note the example below:

SCSI ID 0 disk
SCSI ID 1 disk
SCSI ID 2 disk
SCSI ID 3 disk
SCSI ID 4 disk

SCSI ID 5 tape
SCSI ID 6 tape

SCSI ID 7 is initiator (CQD-420/TM)

The *MU* and *DU* numbers are the unit numbers mapped back to the operating system. If the CQD-420/TM is configured following these guidelines, you can apply this formula to determine the unit number mapped back to the operating system:

SCSI ID of the disk drive
+ the LUN offset for disk
= unit number for disk

SCSI ID of tape drive
- number of disk drives
+ LUN offset for tapes
= unit number for tape

Multi-Hosting Configuration

The following is a list of software requirements for multi-hosting; refer to Appendix A for supported multi-hosting devices:

- VMS version 5.3 or above
- VAX cluster software must be running on both systems with at least one of the DEC's interconnects operational
- Tape drives can only be mounted to one system at a time
- Allocation classes must be the same for all systems when installing disk drives (value must not equal 0).

Using VMS and the CQD-420/TM, you can multi-host by following the instructions below:

1 Configure the CQD-420 to SCSI ID 7 for the first computer; configure the CQD-420 to SCSI ID 6 for the second computer. If you need to alter the Host Adapter SCSI ID change the jumper settings as shown in Table 4-4.

Table 4-4 Host Adapter ID Selection

SW3-1	SW3-2	SW3-3	Initiator ID
ON	ON	ON	Host adapter ID = 7 highest priority (F)
ON	ON	OFF	Host adapter ID = 6
ON	OFF	ON	Host adapter ID = 5
ON	OFF	OFF	Host adapter ID = 4
OFF	ON	ON	Host adapter ID = 3
OFF	ON	OFF	Host adapter ID = 2
OFF	OFF	ON	Host adapter ID = 1
OFF	OFF	OFF	Host adapter ID = 0, lowest priority

Note that (F) means factory setting.

2 From the Additional Utilities Menu in the On-Board Utility, follow these instructions:

a Select option *D* to display current configuration.

b Answer *Y* to the statement: `CHANGE CONFIGURATION ? (Y/N)` The configuration menu shown on page 4-12 will display.

c Select Z to reset configuration back to default.

d Answer *Y* to reconfigure the adapter.

NOTE If you ever reconfigure the board, you must reset the configuration to default using selection Z.

e Select *R* to toggle SCSI reset. Then set the SCSI reset to OFF. Do this for all SCSI host adapters to be multi-hosted.

f Answer Y to reconfigure the adapter.

g Select C to reconfigure the device. Then configure the CQD-420 for exact number of disks and tapes. This will inhibit scanning of other host adapters (see menu example on page 4-12).

h If other MSCP disks are in the cluster, follow the rules in the subsection "Changing LUN Offset" in "On-Board Utility" so that each device has a unique unit number.

i Exit out of the On-Board Utility.

NOTE In a multi-hosting system the *physical* disk device name must be identical on both systems.

3 Terminate both *physical* ends of the SCSI bus.

Single-ended—If the CQD-420 is at either end of the SCSI bus, remove on-board terminators, RP1, RP3, and use a pass-through terminator as close to the board as possible. If the CQD-420 is in the middle of the SCSI bus, RP1 and RP3 terminators *must* be removed, *do not* use pass through terminators.

Differential—If the CQD-420 is at either end of the SCSI bus, remove on-board terminators, U1, U2 and use a pass-through terminator as close to the board as possible. If the CQD-420 is in the middle of the SCSI bus, U1 and U2 terminators *must* be removed, *do not* use pass through terminators.

In the event that one system becomes inoperable with only two nodes in the VAX cluster, a quorum disk must be used to count as a vote; this keeps the other system running. Refer to VMS VAXcluster manual order number AA-LA27A-TE to set up a quorum disk and a VAX cluster.

NOTE When running *cluster_config.com* on a system with only Ethernet as a computer interconnect, answer *Yes* for the question, `WILL THIS BE A SATELLITE NODE?`

Partitioning Configuration

You may partition a device into two or four sections under VMS or ULTRIX using the CQD-420/TM. To partition a device, follow the instructions below.

1 Configure the SCSI devices as explained in the section "Displaying SCSI Device and Setting Up Configuration."

2 Select *D* from "Additional Utilities." The current configuration will display all physical devices:

```
DEV0:   DU0 SCSI ID 0 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV1:   DU1 SCSI ID 1 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV2:   DU2 SCSI ID 2 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV3:   DU3 SCSI ID 3 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV4:   MU0 SCSI ID 4 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV5:   MU1 SCSI ID 5 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV6:   MU2 SCSI ID 6 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV7    SCSI ID 7 HOST ADAPTER. SCSI Reset OFF,Density Mode OFF,Default Tape OFF.
        Rew/Im OFF,Eject Disk ON,Truncate Size OFF,RCT size= OFF,RA dev= DEF.
        Rsv/Rls Option ON,MSCP credit = 16,sync rate = 04 MB/sec.
        RSX FP OFF,Sel Timeout = 250 ms
        (PMR=Prevent Medium Removal WWV-Write W/Verify)
```

3 Answer *Y* to the question that appears on the screen: `CHANGE CONFIGURATION (Y/N)?` The configuration menu will appear:

```
R - Toggle SCSI Reset           M - Toggle Density Mode
D - Toggle Disconnect           B - Toggle Buffer/Truncate Mode
S - Toggle Sync/Async           W - Toggle Density/Write Verify Mode
C - Reconfigure Device          P - Toggle Prevent Medium Removal
A - Set the RA number           1 - Toggle device RA
E - Eject after Dismount        2 - Toggle device RCT
G - Toggle RSX w/floppy
J - Change Selection Timeout Period
K - Toggle Host/Target Queue Mode
L - Reserve/Release Disk
Q - Allow Rewind w/No-Wait
T - Reset All Device
U - Toggle Default Tape
V - Truncate for Volume Shadowing
Y - Set the RCT size
Z - Reset Controller
( Hit <return> key to exit )

SELECT OPTION ? Z
```

4 Select Z to reset configuration back to default. Answer Y to reconfigure the adapter. This step is IMPERATIVE!

NOTE If you ever reconfigure the board, you must reset the configuration to default using selection Z.

5 Select Option C. Answer Y to the devices to be partitioned as shown in the following screen simulation:

```
Number of Disks? (0-7)  4                 [total number of logical disks]
   DU0 to be Reconfigured ? (Y/N)  Y
   DU0 SCSI ID ? (0-7)  0
   DU0 LUN ? (0-3)  0
   Number of Partitions ? (NONE, 2, 4) 2 [N is the default]
   DU2 to be Reconfigured ? (Y/N)  Y
   DU2 SCSI ID ? (0-7)  1
   DU2 LUN ? (0-3)  1
   Number of Partitions ? (NONE, 2, 4) 2 [N is the default]

Number of Tapes? (0-3)  3
   MU0 to be Reconfigured ? (Y/N)  N
   MU1 to be Reconfigured ? (Y/N)  N
   MU2 to be Reconfigured ? (Y/N)  N
```

After you have completed configuration, the system will display device configuration similar to the following example:

```
DEV0:   DU0 SCSI ID 0 LUN 0 MICROP 1598-15MD1063303SI125
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV1:   DU1 SCSI ID 0 LUN 0 MICROP 1598-15MD1063303SI125
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV2:   DU2 SCSI ID 1 LUN 0 MICROP 1588-15MB1036810IC09
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV3:   DU3 SCSI ID 1 LUN 0 MICROP 1588-15MB1036810IC09
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV4:   MU0 SCSI ID 4 LUN 0  OFFLINE
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV5:   MU1 SCSI ID 5 LUN 0  OFFLINE
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV6:   MU2 SCSI ID 6 LUN 0  OFFLINE
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV7    SCSI ID 7 HOST ADAPTER. SCSI Reset OFF,Density Mode OFF,Default Tape OFF.
        Rew/Im OFF,Eject Disk ON,Truncate Size OFF,RCT size= OFF,RA dev= DEF.
        Rsv/Rls Option ON,MSCP credit = 16,sync rate = 04 MB/sec.
        RSX FP OFF,Sel Timeout = 250 ms
        (PMR=Prevent Medium Removal WWV=Write W/Verify)
```

6 Format RCT block for each partition of each device. See "Formatting RCT Block" in "Additional Utilities."

7 Exit out of the On-Board Utility.

NOTE The system considers each partition as a device even though the location (LUN) is the same.

Hardware Shadowing Configuration

This section explains how to configure drives into shadow sets. A maximum of three shadow sets can be formed with each controller. For the purpose of this explanation, four disk drives will be divided into two shadow sets with three remaining tape drives as shown below:

DU0 = SCSI ID 0 Primary
DS0 = SCSI ID 1 Shadow drive of DU0
DU1 = SCSI ID 2 Primary
DS1 = SCSI ID 3 Shadow drive of DU1
MU0 = SCSI ID 4
MU1 = SCSI ID 5
MU2 = SCSI ID 6

Single Host Configuration

The following is a sample on-board utility session to configure shadow sets on a single host system. User input is indicated with bold face type.

Begin by selecting *5* from the SCSI Host Adapter Utility...

```
SCSI HOST ADAPTER UTILITY (REV. YYYxZZ)

X - UTILITY EXIT
D - DIAGNOSTIC TEST

[DISK]                                        [TAPE]
1 - LOGICAL UNIT NUMBER OFFSET                6 - LOGICAL UNIT NUMBER OFFSET
2 - FORMAT DRIVE                              7 - ADDITIONAL UTILITIES
3 - QUALIFY DRIVE
4 - MANUALLY REPLACE BAD BLOCKS
5 - ADDITIONAL UTILITIES

SELECT OPTION ? 5

ADDITIONAL UTILITIES       (REV. YYYxZZ)       SN = 1278

D = DISPLAY SCSI DEVICE AND SET UP CONFIGURATION
C = CATCH-UP COPY FOR NOT ALIGNED SHADOW
S = SEND SCSI COMMAND TO THE DEVICE
T - TEST SCSI DEVICE
R - FORMAT RCT BLOCK

SELECT OPTION ? D

DEV0:   DU0 SCSI ID 0 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV1:   DU1 SCSI ID 1 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV2:   DU2 SCSI ID 2 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV3:   DU3 SCSI ID 3 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV4:   MU0 SCSI ID 4 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV5:   MU1 SCSI ID 5 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV6:   MU2 SCSI ID 6 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV7    SCSI ID 7 HOST ADAPTER, SCSI Reset OFF,Density Mode OFF,Default Tape OFF.
        Rew/Im OFF,Eject Disk ON,Truncate Size OFF,RCT size= OFF,RA dev= DEF.
        Rsv/Rls Option ON,MSCP credit = 16,sync rate = 04 MB/sec.
        RSX FP OFF,Sel Timeout = 250 ms
        (PMR=Prevent Medium Removal WWV=Write W/Verify)

CHANGE CONFIGURATION? (Y/N) Y

CONFIGURE FOR MULTI-HOST? (Y/N) N
```

```
R = Toggle SCSI Reset              M = Toggle Density Mode
D = Toggle Disconnect              B = Toggle Buffer/Truncate Mode
S = Toggle Sync/Async              W = Toggle Density/Write Verify Mode
C = Reconfigure Device             P = Toggle Prevent Medium Removal
A = Set the RA number              1 = Toggle device RA
E = Eject after Dismount           2 = Toggle device RCT
G = Toggle RSX w/floppy
J = Change Selection Timeout Period
K = Toggle Host/Target Queue Mode
L = Reserve/Release Disk
Q = Allow Rewind w/No-Wait
T = Reset All Device
U = Toggle Default Tape
V = Truncate for Volume Shadowing
Y = Set the RCT size
Z = Reset Controller
( Hit <return> key to exit )

SELECT OPTION ? C
```

The utility will ask you a series of questions...

```
Number of Disks (including shadow
units)? (0-7) 4
```

Enter the total number of disk drives that will be on the SCSI bus.

```
Number of Shadow sets? (0-2) 2
```

Enter the number of shadow pairs.

```
Break Unit LUN Offset? (Minimum 4) 4
```

In the event of disk failure, or the dissolving of a shadow set, this will become the device of the failed, or dissolved, member of the shadow set.

```
DUOS to be Reconfigured? (Y/N) Y

DUOS SCSI ID? (0-7) 0

DUOS LUN? (0-3) 0

Shadow unit exist? (Y/N) Y
```

This device will become the primary unit of the shadow set.

```
Enable the shadow set? (Y/N) Y
```

This will form the shadow set so that the two drives in the set will appear as one device to the operating system.

```
Shadow set already Aligned? (Y/N) N
```

If the data on the disks to be shadowed is not identical, then you must answer no to this question.

In this example, the shadow set will be formed "unaligned" and must be initialized before being used.

```
Is above Primary drive (Y/N) Y

DSO SCSI ID? (0-7) 1
```

This will become the secondary drive in the shadow set.

```
DS0 LUN ? (0-3) 0
```

Repeat the last nine steps to form the second shadow set

```
DU1S to be Reconfigured? (Y/N) Y

DU1S SCSI ID? (0-7) 2

DU1S LUN? (0-3) 0

Shadow unit exist? (Y/N) Y

Enable the shadow set? (Y/N) Y

Shadow set already Aligned? (Y/N) N

Is above Primary drive (Y/N) Y

DS1 SCSI ID? (0-7) 3

DS1 LUN ? (0-3) 0

Number of Tapes? (0-3) 0
```

The system will display the current device configuration.

```
DEV0:   DU0S SCSI  ID 0 LUN 0
        Disc ON.Sync ON.PMR ON.WWV OFF.Tag-Q OFF.RCT OFF.RA OFF.
DEV1:   DU1S SCSI  ID 2 LUN 0
        Disc ON.Sync ON.PMR ON.WWV OFF.Tag-Q OFF.RCT OFF.RA OFF.
DEV2:   DU0X SCSI  ID 1 LUN 0
        Disc ON.Sync ON.PMR ON.WWV OFF.Tag-Q OFF.RCT OFF.RA OFF.
DEV3:   DU1X SCSI  ID 3 LUN 0
        Disc ON.Sync ON.PMR ON.WWV OFF.Tag-Q OFF.RCT OFF.RA OFF.
DEV4:   NOT AVAILABLE
DEV5:   NOT AVAILABLE
DEV6:   NOT AVAILABLE
DEV7    SCSI ID 7 HOST ADAPTER. SCSI Reset OFF.Density Mode OFF.Default Tape OFF.
        Rew/Im OFF.Eject Disk ON.Truncate Size OFF.RCT size= OFF.RA dev= DEF.
        Rsv/Rls Option ON.MSCP credit = 16.sync rate = 04 MB/sec.
        RSX FP OFF.Sel Timeout = 250 ms
        (PMR=Prevent Medium Removal WWV=Write W/Verify)

CHANGE CONFIGURATION? (Y/N) N
```

The system will scan the SCSI devices on the bus and redisplay the configuration.

```
DEV0:   DU0S SCSI ID 0 LUN 0 MICROP 1598-15MD1063302SI125
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV1:   DU1S SCSI ID 2 LUN 0 MICROP 1598-15MD1063302SI125
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV2:   DU0X SCSI ID 1 LUN 0 MICROP 1598-15MD1063302SI125
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV3:   DU1X SCSI ID 3 LUN 0 MICROP 1598-15MD1063302SI125
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV4:   NOT AVAILABLE
DEV5:   NOT AVAILABLE
DEV6:   NOT AVAILABLE
DEV7    SCSI ID 7 HOST ADAPTER, SCSI Reset OFF,Density Mode OFF,Default Tape OFF,
        Rew/Im OFF,Eject Disk ON,Truncate Size OFF,RCT size= OFF,RA dev= DEF,
        Rsv/Rls Option ON,MSCP credit = 16,sync rate = 04 MB/sec,
        RSX FP OFF,Sel Timeout = 250 ms
        (PMR=Prevent Medium Removal WWV=Write W/Verify)

CHANGE CONFIGURATION? (Y/N) N
```

The system will display the "Additional Utilities" screen.

```
ADDITIONAL UTILITIES        (REV. YYYxZZ)       SN = 1278

D - DISPLAY SCSI DEVICE AND SET UP CONFIGURATION
C - CATCH-UP COPY FOR NOT ALIGNED SHADOW
S - SEND SCSI COMMAND TO THE DEVICE
T - TEST SCSI DEVICE
R - FORMAT RCT BLOCK

SELECT OPTION ?
```

Press *Ctrl+C* to exit to the main menu of the SCSI Host Adapter Utility.

```
SCSI HOST ADAPTER UTILITY (REV. YYYxZZ)

X - UTILITY EXIT
D - DIAGNOSTIC TEST

[DISK]                                      [TAPE]
1 = LOGICAL UNIT NUMBER OFFSET              6 - LOGICAL UNIT NUMBER OFFSET
2 = FORMAT DRIVE                            7 - ADDITIONAL UTILITIES
3 = QUALIFY DRIVE
4 - MANUALLY REPLACE BAD BLOCKS
5 = ADDITIONAL UTILITIES

SELECT OPTION ? X
```

Enter *X* to exit from the utility. This will reinitialize the controller.

Multi-Host Configuration

The following is a sample on-board utility session to configure shadow sets on a multi-host system. User input is indicated with bold face type.

Begin by selecting 5 from the SCSI Host Adapter Utility.

```
SCSI HOST ADAPTER UTILITY (REV. YYYxZZ)

X = UTILITY EXIT
D = DIAGNOSTIC TEST

[DISK]                                          [TAPE]
1 = LOGICAL UNIT NUMBER OFFSET                  6 = LOGICAL UNIT NUMBER OFFSET
2 = FORMAT DRIVE                                7 = ADDITIONAL UTILITIES
3 = QUALIFY DRIVE
4 = MANUALLY REPLACE BAD BLOCKS
5 = ADDITIONAL UTILITIES

SELECT OPTION ? 5

ADDITIONAL UTILITIES       (REV. YYYxZZ)       SN = 1278

D = DISPLAY SCSI DEVICE AND SET UP CONFIGURATION
C = CATCH-UP COPY FOR NOT ALIGNED SHADOW
S = SEND SCSI COMMAND TO THE DEVICE
T = TEST SCSI DEVICE
R = FORMAT RCT BLOCK

SELECT OPTION ? D

DEV0:   DU0 SCSI ID 0 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV1:   DU1 SCSI ID 1 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV2:   DU2 SCSI ID 2 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV3:   DU3 SCSI ID 3 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV4:   MU0 SCSI ID 4 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV5:   MU1 SCSI ID 5 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV6:   MU2 SCSI ID 6 LUN 0
        Disc ON,Sync ON,3-Density ON,Buffer ON.
DEV7    SCSI ID 7 HOST ADAPTER. SCSI Reset OFF,Density Mode OFF,Default Tape OFF.
        Rew/Im OFF,Eject Disk ON,Truncate Size OFF,RCT size= OFF,RA dev= DEF.
        Rsv/Rls Option ON,MSCP credit = 16,sync rate = 04 MB/sec.
        RSX FP OFF,Sel Timeout = 250 ms
        (PMR=Prevent Medium Removal WWV=Write W/Verify)

CHANGE CONFIGURATION? (Y/N) Y
```

```
CONFIGURE FOR MULTI-HOST? (Y/N) Y

***Warning***
  The configuration might be replaced, refer to menu for details.
```

Note: If this is the second controller to be configured in the multiple-host configuration, then a *Y* answer will give this controller an identical configuration.

```
Enter the lowest host ID? (0-6) 6
```

This is the controller's SCSI ID.

The change configuration menu will appear.

```
R - Toggle SCSI Reset            M - Toggle Density Mode
D - Toggle Disconnect            B - Toggle Buffer/Truncate Mode
S - Toggle Sync/Async            W - Toggle Density/Write Verify Mode
C - Reconfigure Device           P - Toggle Prevent Medium Removal
A - Set the RA number            1 - Toggle device RA
E - Eject after Dismount         2 - Toggle device RCT
G - Toggle RSX w/floppy
J - Change Selection Timeout Period
K - Toggle Host/Target Queue Mode
L - Reserve/Release Disk
Q - Allow Rewind w/No-Wait
T - Reset All Device
U - Toggle Default Tape
V - Truncate for Volume Shadowing
Y - Set the RCT size
Z - Reset Controller
( Hit <return> key to exit )

SELECT OPTION ? C
```

Select C to reconfigure the device and answer the following questions.

```
Number of Disks (including shadow units)?
(0-7) 4
```

Enter the total number of disk drives that will be on the SCSI bus.

```
Number of Shadow sets? (0-2) 2
```

Enter the number of shadow pairs.

```
Break Unit LUN Offset? (Minimum 4) 4
```

In the event of disk failure, or the dissolving of a shadow set, this will become the device of the failed, or dissolved, member of the shadow set.

```
DUOS to be Reconfigured? (Y/N) Y

DUOS SCSI ID? (0-7) 0

DUOS LUN? (0-3) 0

Shadow unit exist? (Y/N) Y
```

This device will become the primary unit of the shadow set.

```
Enable the shadow set? (Y/N) Y
```

This will form the shadow set so that the two drives in the set will appear as one device to the operating system.

```
Shadow set already Aligned? (Y/N) N
```

If the data on the disks to be shadowed is not identical, then you must answer no to this question.

In this example, the shadow set will be formed "unaligned" and must be initialized before being used.

```
Is above Primary drive (Y/N) Y

DS0 SCSI ID? (0-7) 1
```

This will become the secondary drive in the shadow set.

```
DS0 LUN ? (0-3) 0
```

Repeat the last nine steps to form the second shadow set

```
DU1S to be Reconfigured? (Y/N) Y

DU1S SCSI ID? (0-7) 2

DU1S LUN? (0-3) 0

Shadow unit exist? (Y/N) Y

Enable the shadow set? (Y/N) Y

Shadow set already Aligned? (Y/N) N

Is above Primary drive (Y/N) Y

DS1 SCSI ID? (0-7) 3

DS1 LUN ? (0-3) 0

Number of Tapes? (0-3) 0

Update drive configuration block? (Y/N) Y
```

This will write shadow set status information to the drives so both hosts can interrogate it.

The system will display the current device configuration.

```
DEV0:   DUOS SCSI ID 0 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV1:   DU1S SCSI ID 2 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV2:   DUOX SCSI ID 1 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV3:   DU1X SCSI ID 3 LUN 0
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV4:   NOT AVAILABLE
DEV5:   NOT AVAILABLE
DEV6:   NOT AVAILABLE
DEV7    SCSI ID 7 HOST ADAPTER. SCSI Reset OFF,Density Mode OFF,Default Tape OFF.
        Rew/Im OFF,Eject Disk ON,Truncate Size OFF,RCT size= OFF,RA dev= DEF.
        Rsv/Rls Option ON,MSCP credit = 16,sync rate = 04 MB/sec.
        RSX FP OFF,Sel Timeout = 250 ms
        (PMR=Prevent Medium Removal WWV=Write W/Verify)

CHANGE CONFIGURATION? (Y/N) N
```

Enter *N* to the question CHANGE CONFIGURATION? (Y/N). The system will scan the SCSI devices on the bus and redisplay the configuration.

```
DEV0:   DUOS SCSI ID 0 LUN 0 MICROP 1598-15MD1063302SI125
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV1:   DU1S SCSI ID 2 LUN 0 MICROP 1598-15MD1063302SI125
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV2:   DUOX SCSI ID 1 LUN 0 MICROP 1598-15MD1063302SI125
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV3:   DU1X SCSI ID 3 LUN 0 MICROP 1598-15MD1063302SI125
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV4:   NOT AVAILABLE
DEV5:   NOT AVAILABLE
DEV6:   NOT AVAILABLE
DEV7    SCSI ID 7 HOST ADAPTER. SCSI Reset OFF,Density Mode OFF,Default Tape OFF.
        Rew/Im OFF,Eject Disk ON,Truncate Size OFF,RCT size= OFF,RA dev= DEF.
        Rsv/Rls Option ON,MSCP credit = 16,sync rate = 04 MB/sec.
        RSX FP OFF,Sel Timeout = 250 ms
        (PMR=Prevent Medium Removal WWV=Write W/Verify)

CHANGE CONFIGURATION? (Y/N) Y

Keep multi-host setup? (Y/N) Y
```

The system will display the configuration menu.

```
R - Toggle SCSI Reset          H - Toggle Density Mode
D - Toggle Disconnect          B - Toggle Buffer/Truncate Mode
S - Toggle Sync/Async          W - Toggle Density/Write Verify Mode
C - Reconfigure Device         P - Toggle Prevent Medium Removal
A - Set the RA number          1 - Toggle device RA
E - Eject after Dismount       2 - Toggle device RCT
G - Toggle RSX w/floppy
J - Change Selection Timeout Period
K - Toggle Host/Target Queue Mode
L - Reserve/Release Disk
Q - Allow Rewind w/No-Wait
T - Reset All Device
U - Toggle Default Tape
V - Truncate for Volume Shadowing
Y - Set the RCT size
Z - Reset Controller
( Hit <return> key to exit )

SELECT OPTION ? R
```

Enter *R* to toggle SCSI Reset. This option is neccessary for multiple-host configurations. It will disable unwanted SCSI resets.

```
Update drive configuration block? (Y/N) N
```

The system will scan the SCSI devices on the bus and redisplay the device configuration screen.

```
DEV0:   DU0S SCSI ID 0 LUN 0 MICROP 1598-15MD1063302SI125
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV1:   DU1S SCSI ID 2 LUN 0 MICROP 1598-15MD1063302SI125
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV2:   DU0X SCSI ID 1 LUN 0 MICROP 1598-15MD1063302SI125
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV3:   DU1X SCSI ID 3 LUN 0 MICROP 1598-15MD1063302SI125
        Disc ON,Sync ON,PMR ON,WWV OFF,Tag-Q OFF,RCT OFF,RA OFF.
DEV4:   NOT AVAILABLE
DEV5:   NOT AVAILABLE
DEV6:   NOT AVAILABLE
DEV7    SCSI ID 7 HOST ADAPTER, SCSI Reset OFF,Density Mode OFF,Default Tape OFF.
        Rew/Im OFF,Eject Disk ON,Truncate Size OFF,RCT size= OFF,RA dev= OFF.
        Rsv/Rls Option ON,MSCP credit - 16,sync rate - 04 MB/sec.
        RSX FP OFF,Sel Timeout - 250 ms
        (PMR=Prevent Medium Removal WWV=Write W/Verify)

CHANGE CONFIGURATION? (Y/N) N
```

Enter *N* to the question "CHANGE CONFIGURATION?" and press *Ctrl+C* to exit to the main menu of the SCSI Host Adapter Utility.

```
SCSI HOST ADAPTER UTILITY (REV. YYYxZZ)

X - UTILITY EXIT
D - DIAGNOSTIC TEST

[DISK]                                      [TAPE]
1 - LOGICAL UNIT NUMBER OFFSET              6 - LOGICAL UNIT NUMBER OFFSET
2 - FORMAT DRIVE                            7 - ADDITIONAL UTILITIES
3 - QUALIFY DRIVE
4 - MANUALLY REPLACE BAD BLOCKS
5 - ADDITIONAL UTILITIES

SELECT OPTION ? X
```

Enter *X* to exit from the utility. This will reinitialize the controller.

Performing a Catch Up on a Shadow Set

When you configure a shadow set with two new drives, the shadow set will be operational as soon as you configure the controller and initialize the drives. The following example, shows how to restore a shadow set or to create a shadow set by combining a secondary drive with a drive that already has data on it. (You may perform a catch up with the Super Hardware Shadow Utility from CMD if you purchased this optional software.)

Invoke the the SCSI Host Adapter Utility.

```
SCSI HOST ADAPTER UTILITY (REV. YYYxZZ)

X - UTILITY EXIT
D - DIAGNOSTIC TEST

[DISK]                                      [TAPE]
1 - LOGICAL UNIT NUMBER OFFSET              6 - LOGICAL UNIT NUMBER OFFSET
2 - FORMAT DRIVE                            7 - ADDITIONAL UTILITIES
3 - QUALIFY DRIVE
4 - MANUALLY REPLACE BAD BLOCKS
5 - ADDITIONAL UTILITIES

SELECT OPTION ? 5
```

The "Additional Utilities" screen will appear.

```
ADDITIONAL UTILITIES        (REV. YYYxZZ)        SN - 1278

D - DISPLAY SCSI DEVICE AND SET UP CONFIGURATION
C - CATCH-UP COPY FOR NOT ALIGNED SHADOW
S - SEND SCSI COMMAND TO THE DEVICE
T - TEST SCSI DEVICE
R - FORMAT RCT BLOCK

SELECT OPTION ? C
```

Select option C.

```
DEVICE NUMBER DEV (0-3) DEV 0
```

Enter the device number of either member of the shadow set. The controller will always perform the catch up from the primary to the secondary drive in the shadow set, no matter which device number you enter in response to this prompt. The catch up will begin as soon as you enter a valid response.

At the conclusion of the catch up the system will return to the "SCSI Adapter Utility" menu.

Detecting Shadowing Errors Using VMS

The following instructions will help you detect shadowing errors and shadowing drive failure.

1 At the system prompt, enter `show dev du`.

2 Check the error count for shadowed disk drives.

3 If errors are detected, follow the instructions given in Appendix B, "Troubleshooting," to view "Controller Dependent Information."

Look for information describing which drive has failed such as given below:

/ID x/
/LUNx/
/PORx/

Where:
x is the variable used to represent the ID, LUN, and Port of the failed disk drive.

4 Back up the remaining good shadow set member.

5 Shut down the system.

6 Replace the drive.

7 Enter the On-Board Utility and follow these instructions:

   a Select option *D*. The current configuration will display.

  b Answer *Y* to the question: `DO YOU WANT TO CLEAR SHADOW FAILED STATUS ? <Y/N>`

  c Answer *N* to the question: `CHANGE CONFIGURATION <Y/N>`

  d Exit On-Board Utility.

8 Boot the system.

9 Initialize the specified shadow set in VMS.

10 Restore the backup copy to the specified shadow set.

11 Put the specified drives back on-line by mounting them to VMS.

VMS Configuration

If you followed procedures in "Determining CSR Address" in Chapter 3, VMS software will automatically configure new devices added. *NO* other configuration is required. If VMS does not, run Auto Configure as shown in Appendix D.

ULTRIX Configuration

VAX and DEC systems using ULTRIX software must be manually configured to access the CQD-420 boards.

First, examine current configuration file to determine which controllers and devices are already connected to the system. Then refer to the respective sections for configuration procedures for the CQD-420.

CQD-420/TM

Edit the configuration file by performing the following instructions for the CQD-420/TM. Note the CQD-420/TM must be configured with a higher *klesiu number*, higher *uq number*, and higher *tms numbers* than any other *klesiu* controller; and a higher *uda number*, higher *uq number*, and higher *ra number* than any other *uba* controller in the configuration file.

1 Make sure the following two lines are in the configuration file:

```
adapter  uba&  at  nexus?
```

Where

? = the system will fill in this variable (simply enter this ?).

& = the node ID of the Q-bus adapter.

2. Connect the controller the Q-bus by entering the following line:

```
controller  klesiuϑ at   uba&
controller  uda#   at   uba&
```

Where

ϑ = the variable number that represents the CQD-420/TM.

& = the same number used in step 1.

3. Tell ULTRIX what the name of the controller for the different functions will be:

```
controller uq∇  at   klesiuϑ csr XXXXXXXX vector   uqintr
controller uqΔ  at   uda#   csr XXXXXXXX vector   uqintr
```

Where

∇ = variable used to represent the controller.

Δ = variable used to represent the controller (unique from∇ above).

ϑ = the same number used in step 3 representing the controller.

= the same number used in step 3 representing the controller.

XXXXXXXX = CSR address.

4. Name the tape drives and list drive unit by entering the following line:

```
tape   tms0   at   uq∇  driveα
tape   tms1   at   uq∇  driveβ
disk   ra0   at   uqΔ  driveα
disk   ra1   at   uqΔ  driveβ
```

Where

∇ = the same number used to represent the controller in step 4.

Δ = variable used to represent the controller (unique from ∇ above).

α = the *MU* number in the On-Board Utility displays this configuration.

β = the *DU* number in the On-Board Utility displays this configuration.

5

SCSI Basics

This chapter consists of a SCSI glossary, SCSI commands used by the CQD-420 for MSCP and TMSCP emulation, SCSI status codes, SCSI messages, SCSI single-ended and differential signals.

SCSI Glossary

The following is a glossary of frequently used SCSI terms.

Connect—The function that occurs when an initiator selects a target to start an operation.

Disconnect—The function that occurs when a target release control of the SCSI bus, allowing it to go to the BUS FREE phase.

Initiator—A SCSI device (usually a host system) that requests an operation to be performed by another SCSI device.

LUN—Logic Unit Number.

Peripheral device—A peripheral that can be attached to a SCSI device (e.g., magnetic disk, magnetic tape, or optical disk).

Reconnect —The function that occurs when a target selects an initiator to continue an operation after a disconnect.

SCSI address—The octal representation of the unique address (0-7) assigned to an SCSI device. This address would normally be assigned and set in the SCSI device during system installation.

SCSI ID—The bit-significant representation of the SCSI address referring to one of the signal lines DB (7-0).

SCSI device—A host computer adapter or a peripheral controller or an intelligent peripheral that can be attached to the SCSI bus.

Target—A SCSI device that performs an operation requested by an initiator.

SCSI Commands

SCSI commands used by the CQD-420/TM for MSCP emulation are listed in Table 5-1.

Table 5-1 SCSI Commands (MSCP)

Code	Command Name
00h	Test Unit Ready
01h	Rezero Unit
03h	Request Sense
04h	Format Unit (1)
07h	Reassign Block
08h	Read
0Ah	Write
0Bh	Seek
12h	Inquiry
15h	Mode Select
16h	Reserve Unit
17h	Release Unit
1Ah	Mode Sense
1Bh	Start/Stop Unit
1Eh	Prevent/Allow Medium Removal
25h	Read Capacity
28h	Extended Read
2Ah	Extended Write
2Bh	Extended Seek
3Eh	Read Long (2)
3Fh	Write Long(2)

(1)The Format Unit command is used by the On-Board Utility only.

(2)These commands are used if the drives support them.

SCSI commands used by the CQD-420/TM for TMSCP emulation are listed in Table 5-2.

Table 5-2 SCSI Commands (TMSCP)

Code	Command Name
00h	Test Unit Ready
01h	Rewind
03h	Request Sense
08h	Read
0Ah	Write
10h	Write Filemarks
11h	Space
12h	Inquiry
15h	Mode Select
16h	Reserve Unit
17h	Release Unit
19h	Erase
1Ah	Mode Sense
1Bh	Load/Unload
1Eh	Prevent/Allow Medium Removal

SCSI Status

The SCSI status codes used by CQD-420 are listed in Table 5-3.

Table 5-3 SCSI Status

Code	Status Name
00h	Good
02h	Check Condition
08h	Busy
10h	Intermediate/Good
18h	Reservation Conflict

SCSI Messages

The SCSI Messages used by CQD-420 are listed in Table 5-4.

Table 5-4 SCSI Messages

Code	Message Name
00h	Command Complete
01h	Extended Message
02h	Save Data Pointer
03h	Restore Pointer
04h	Disconnect
05h	Initiator Detected Error
06h	Abort
07h	Message Reject
08h	No Operation
09h	Message Parity Error
80-FFh	Identify

SCSI Single-Ended Signals

This section illustrates the CQD-420 pin assignments for the single-ended channel for non-shielded connector (J1) and the CQD-423 pin assignments for the single-ended shielded connector (J1).

Single-Ended Non-Shielded Connector

Figure 5-1 illustrates the pin locations of the CQD-420 non-shielded SCSI device connector for J1.

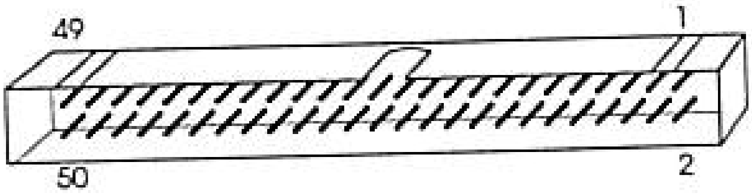


Figure 5-1: SCSI device non-shielded connector

Table 5-5 shows the CQD-420 non-shielded single-ended SCSI connector pin assignments for (J1).

Table 5-5 Single-Ended Non-Shielded Connector Pin Assignments (J1)

Signal	Pin Number
-DB(0)	2
-DB(1)	4
-DB(2)	6
-DB(3)	8
-DB(4)	10
-DB(5)	12
-DB(6)	14
-DB(7)	16
-DB(P)	18
GROUND	20
GROUND	22
GROUND	24
TERMPWR	26
GROUND	28
GROUND	30
-ATN	32
GROUND	34
-BSY	36
-ACK	38
-RST	40
-MSG	42
-SEL	44
-C/D	46
-REQ	48
-I/O	50

NOTE All odd pins except pin 25 are connected to ground. Pin 25 is left open. The minus sign next to the signal indicates active low.

Single-Ended Shielded Connector

Figure 5-2 illustrates pin locations for the single-ended CQD-423 SCSI device shielded connector.

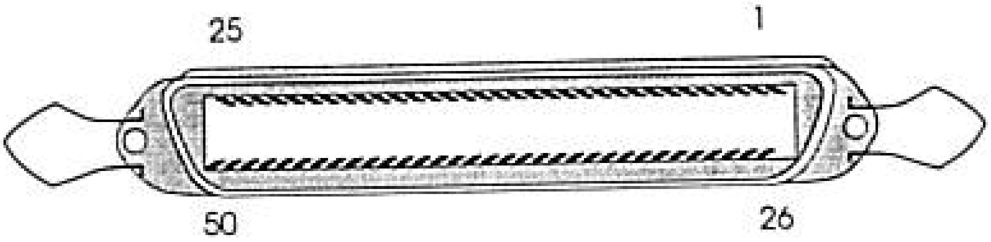


Figure 5-2: SCSI device shielded connector

Table 5-6 illustrates the CQD-423 shielded SCSI connector pin assignments.

Table 5-6 Single-Ended Shielded Connector Pin Assignments (J1)

Signal	Pin Number
-DB(0)	26
-DB(1)	27
-DB(2)	28
-DB(3)	29
-DB(4)	30
-DB(5)	31
-DB(6)	32
-DB(7)	33
-DB(P)	34
GROUND	35
GROUND	36
GROUND	37
TERMPWR	38
GROUND	39
GROUND	40
-ATN	41
GROUND	42
-BSY	43
-ACK	44
-RST	45
-MSG	46
-SEL	47
-C/D	48
-REQ	49
-I/O	50

NOTE Pin 1 to pin 25 (except pin 13) are connected to ground. Pin 13 is left open. The minus sign next to the signal indicates active low.

SCSI Differential Signals

This section illustrates the differential signals for the CQD-420 non-shielded connector and pin assignments and CQD-423 shielded connector and pin assignments for J1.

Differential Non-Shielded Connector

Table 5-7 shows the CQD-420 non-shielded differential SCSI connector pin assignments (see Figure 5-1 for pin locations of the non-shielded connector).

Table 5-7 Differential Non-Shielded Connector Pin Assignments (J1)

Signal	Pin Number	Signal	Pin Number
GROUND	1	GROUND	2
+DB(0)	3	-DB(0)	4
+DB(1)	5	-DB(1)	6
+DB(2)	7	-DB(2)	8
+DB(3)	9	-DB(3)	10
+DB(4)	11	-DB(4)	12
+DB(5)	13	-DB(5)	14
+DB(6)	15	-DB(6)	16
+DB(7)	17	-DB(7)	18
+DB(P)	19	-DB(P)	20
DIFFSENS	21	GROUND	22
GROUND	23	GROUND	24
TERMPWR	25	TERMPWR	26
GROUND	27	GROUND	28
+ATN	29	-ATN	30
GROUND	31	GROUND	32
+BSY	33	-BSY	34
+ACK	35	-ACK	36
+RST	37	-RST	38
+MSG	39	-MSG	40
+SEL	41	-SEL	42
+C/D	43	-C/D	44
+REQ	45	-REQ	46
+I/O	47	-I/O	48
GROUND	49	GROUND	50

Differential Shielded Connector

Table 5-8 illustrates the CQD-423 shielded SCSI connector pin assignments for J1 (see Figure 5-2 for pin locations of the shielded connector).

Table 5-8 Differential Shielded Connector Pin Assignments (J1)

Signal	Pin Number	Signal	Pin Number
GROUND	1	GROUND	26
+DB(0)	2	-DB(0)	27
+DB(1)	3	-DB(1)	28
+DB(2)	4	-DB(2)	29
+DB(3)	5	-DB(3)	30
+DB(4)	6	-DB(4)	31
+DB(5)	7	-DB(5)	32
+DB(6)	8	-DB(6)	33
+DB(7)	9	-DB(7)	34
+DB(P)	10	-DB(P)	35
DIFFSENS	11	GROUND	36
GROUND	12	GROUND	37
TERMPWR	13	TERMPWR	38
GROUND	14	GROUND	39
+ATN	15	-ATN	40
GROUND	16	GROUND	41
+BSY	17	-BSY	42
+ACK	18	-ACK	43
+RST	19	-RST	44
+MSG	20	-MSG	45
+SEL	21	-SEL	46
+C/D	22	-C/D	47
+REQ	23	-REQ	48
+I/O	24	-I/O	49
GROUND	25	GROUND	50

A

Supported Devices and Operating Systems

SCSI Devices

The following subsections list devices supported by the CQD-420. Contact CMD Technical Support for correct firmware revision for the drives listed; devices marked by the following symbols are qualified as follows:

italics	indicates new qualified device
bold	indicates device supports multi-hosting
bolded italics	indicates new qualified device supporting multi-hosting.

Magnetic disk drives supported

SEAGATE	WREN VI , SWIFT (3-1/2-inch) SABRE 8-inch, WREN VII, *WREN VIII, ELITE I & II (5400 RPM)*
CONNER	CP-3100, *CP3200*
CITOH	YD-3042, YD3082
DEC	*RZ23 , RZ24 , RZ56 , RZ57*
FUJITSU	M2246SA Series, *M2263SA*, M2249SA, M2266SA
HITACHI	DK515C Series , *DK516C*
HP	97548S/D series, C2233, C2234, C2235, C3010, C3009, C3007
IBM	320-MB, 3-1/2-inch
MAXTOR	XT-4000S Series, XT-8000S Series
MICROPOLIS	*1588-15*, 1598
QUANTUM	ProDrive 40S/80S
TEAC	*FD235HS (3-1/2-inch FLOPPY, DEC RX23 compatible)* *FD55GS (5 1/4-INCH FLOPPY, DEC RX33 compatible)*

More disk drives will be qualified soon.

Erasable Optical disk drives supported

MAXOPTICS	Tahiti 1, Tahiti 2
SONY	SMO-D501, SMO-D502, SMO-E501
RICOH	*RO-5030E, RO-5030E2*

Erasable Optical disk cartridge manufacturers

SONY, RICOH, MAXOPTICS, PDO, 3M.

CD ROM disk drives supported

DEC	RRD40 , RRD42
LMS	CM210, CM212
TOSHIBA	XM3200 series

WORM drives supported

1 With Ten X Technology Optical Conversion Unit

All WORM drives supported by the optical conversion unit.

2 With LASERDRIVE interface

LASERDRIVE	Model 800 series

Tape drives supported

1 8-mm helical scan tape drives

EXABYTE	EXB-8200, EXB-8500

2 4-mm DAT drives (Digital Audio Tape)

Archive	Python 4520 DAT
GIGATREND	1200 series DAT
HP	35450A DAT, 35470A, 35480A
SONY	SDT-1000 DAT
WangDat	1300 DAT, 2600 DAT, 3200 DAT
Wangtek	6130 series DAT

3 VHS helical scan tape drives

Digidata

Metrum

4 IBM-3480 compatible 18-track cartridge tape drives

ASPEN	System 480
FUJITSU	M2480 series, 2680
LMS	Independence
Storage Tech	4280 series (model Summit)
Cipher	T480

5	9 track reel to reel tape drives	
	Cipher	F880-II, M990, M995
	HP	Model 88780B
	KENNEDY	Model 9612
	M4 data	Model 9914
	STORAGE TECH	Model 2925, 9914
	QUALSTAR	Model 340
	TELEX	Model 9294
	DEC	TSZ07
6	TK50 compatible tape drives	
	DEC	TZ30

Operating Systems

All DEC-compatible products designed by CMD Technology, Inc. implement MSCP (Mass Storage Control Protocol)/TMSCP (Tape Mass Storage Control Protocol). CMD supports its implementation of MSCP/TMSCP beginning with the indicated version of the DEC operating systems listed in Table A-1.

Table A-1 Operating Systems Supported by CQD-420/423

VMS®	4.0 to 5.5
ULTRIX™	1.2 to 4.2
Unix/Berkeley™	4.2 to 4.3
RSX-11M	Disk 4.1-5.3, Tape 4.2-5.3
RSX-11M-Plus	3.0-4.3
RSTS/E	Disk 9.0-10.0, Tape 9.5-10.0
RT-11	Disk 5.1-5.5, Tape 5.4-5.5
DSM-11	3.3-4.1
ISM-11	3.4
TSX+	(see RT-11)
VAXELN	x.x
AT&T UNIX®	System V

B
Troubleshooting

VMS Analyze/Error Utility

The CQD-420 logs controller dependent information in *ERRLOG.SYS* file. User can use the VMS ANALYZE/ERROR Utility to open the file *ERRLOG.SYS* and display the error messages for troubleshooting. By including option switches such as */SINCE=DATE* and */INCLUDE=MUB0*, you may define the time reference and device. To enter the ANALYZE/ERROR Utility, log onto the system and enter the following command:

```
ana/err/since=[time]/include=[device]
```

Some examples are shown by the following:
To view all errors that VMS has logged, enter:

```
ana/err
```

To view the errors only on tape devices, enter:

```
ana/err/inc=tapes
```

To view the errors that have occured only on one tape unit (MUB0), enter;

```
ana/err/inc=mubo
ana/err/inc=(ptb,mubo)
```

To view the MUB0 errors that occured on April 20, 1990 since 14:22 (02:22 PM), enter:

```
ana/err/since=20-Apr-1989:14:22/inc=mubo
```

One example of the error log message is shown in below:

```
BEGINING OF INTERVENING ENTRIES
*************************ENTRY    6.*************************

                                                      LOGGED ON SID 02005F78
ERROR SEQUENCE  9.
ERL$LOGMESSAGE ENTRY                    20-APR-1989   10:21:55.41
                     KA750              REV# 120.     UCODE     REV# 95.
I/O SUB-SYSTEM, UNIT _MUA0:
MESSAGE TYPE                0002
                                        TAPE MSCP MESSAGE

MSLG$L_CMD_REF          99730004
MSLG$W_SEQ_NUM              0001
                                        SEQUENCE #1.

MSLG$B_FORMAT                 00
                                        CONTROLLER ERROR

MSLG$B_FLAGS                  00
MSLG$W_EVENT                00E8        DATA ERROR
                                        UNRECOVERABLE ECC ERROR


MSLG$Q_CNT_ID           00340000
                        03090000
                                        UNIQUE IENTIFIER, 000000340000
                                        TAPE CLASS DEVICE
                                        TK50P
MSLG$B_CNT_SVR                01
                                        CONTROLLER SOFTWARE VERSION #1.

MSLG$B_CNT_HVR                01
                                        CONTROLLER HARDWARE VERSION #1.
```

Controller Dependent Information: Listed below is the controller dependent information for the CQD-420.

```
                                      ;COMMENTS:
                                      ;SCSI COMMAND, 6 BYTES
LONGWORD 1.          00000008         ;COMMAND BYTE 3 TO 0
                       /..../         ;(LEFT TO RIGHT, BYTE 3,2,1,0)
LONGWORD 2.          00000050         ;BYTE 7 TO 6 DONT CARE
                                      ;COMMAND BYTE 5 TO 4
                       /P.../         ;EXTENDED SENSE, 26 BYTES
LONGWORD 3.          00030070         ;SENSE DATA BYTE 3 TO 0
                       /P.../         ;(LEFT TO RIGHT, BYTE 3,2,1,0)
LONGWORD 4.          12000000         ;SENSE DATA BYTE 7 TO 4
                       /..../;
LONGWORD 5.          00000000         ;SENSE DATA BYTE 11 TO 8
                       /..../;
LONGWORD 6.          00000000         ;SENSE DATA BYTE 15 TO 12
                       /..../;
LONGWORD 7.          10000000         ;SENSE DATA BYTE 19 TO 16
                       /..../;
LONGWORD 8.          04000000         ;SENSE DATA BYTE 23 TO 20
                       /..../;
LONGWORD 9.          0000E202         ;SENSE DATA BYTE 26 TO 24
                       /.b../;
LONGWORD 10          00000000         ;(RESERVED)
                       /..../;
```

Refer to the SCSI tape drive manual for a description of the error reported by the tape drive or call CMD for more detailed information.

Cables

If the system does not recognize the CQD-420 or devices connected, check the cable connections. Make sure pin 1 on the cable is aligned with pin 1 on the SCSI device or CQD-420. Make sure pins are *NOT* bent.

LED Indicators

When the Red LED is lit, turn system "**OFF**" and reboot. If the Red LED is still lit, call CMD technical support at (800) 426-3832 or (714) 454-0800.

CMD Technical Support

Having a CMD board entitles you to responsive technical support. Before you call CMD Technical Support, please gather the information listed below that pertains to your configuration. Make a note of any on-screen messages when a problem occurs and have this manual close by.

CMD	CMD product model number and serial number. Firmware Rev. of CMD board as shown on Eprom on the CQD-420 with a blue CMD logo and copyright label. Listing of jumper settings on the board. Distributor company and contact.
SCSI	SCSI devices model numbers and firmware Rev. as shown in the On-Board Utility. Settings of SCSI ID numbers of all devices.
Computer	Computer model. Operating System version. Complete listing of other controllers in computer backplane. Specify multi-hosting or clustering.
Problem	Describe exact nature of problem. Specify detailed error messages. Specify any recent modification to the system. Is this a new installation? Does the problem occur consistently? Does the problem occur when you do not use the board? Does the problem occur with another system (if available)?

You may contact CMD Technical Support from 8:30 AM to 5:30 PM, Pacific Standard Time, Monday through Friday, excluding major holidays, at:

(714) 454-0800 or
(800) 426-3832 or
(714) 455-1656 FAX

C

Jumper Settings

This chapter lists the jumper settings and CSR addresses for the CQD-420.

Pin Assignments

Fig. C-1 shows the physical pin number assignments and functions of the J2 RS-232 port for accessing the On-Board Utility and J3 Front Panel Interface. For CMD's On-Board RS-232 Utility, only pins 2, 4, 9 and grounds are used.

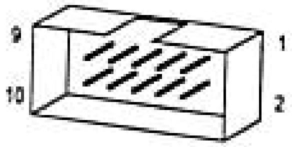


Figure C-1: Pin Locations for J2 (CQD-420) and J3

Figure C-1 shows pin assignments for the RS-232 Port, J2B, of the CQD-423.

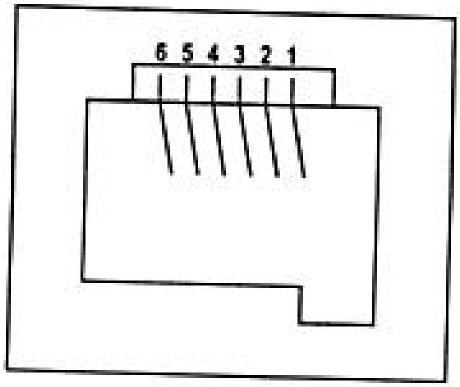


Figure C-2: Pin Locations for J2B (CQD-423)

Connector J2 for the CQD-420 and J2B for the CQD-423 pin assignments are listed in Table C-1 shown when you are facing the connector from the controller's top edge.

Table C-1 Pin Assignments for RS-232 Utility Interface

J2 (CQD-420)	J2B (CQD-423)	Pin Assignments
Pin 1	Pin 1	No connect
Pin 2		Ground
Pin 3	Pin 5	TXD, transmit data for RS-232 application.
Pin 4	Pin 3	Ground
Pin 5	Pin 4	No connect
Pin 6		No connect
Pin 7		No connect
Pin 8	Pin 2	RXD, receive data for RS-232 application.
Pin 9		Ground
Pin 10	Pin 6	No connect

Table C-2 lists pin assignments for the Front Panel Interface (J3).

Table C-2 Pin Assignments for Front Panel Interface J3

Pin 1	Reserved
Pin 2	Ground
Pin 3	No connect
Pin 4	Ground
Pin 5	Drive 0 activity, output signal, active low.
Pin 6	Drive 1 activity, output signal, active low.
Pin 7	Drive 1 write protect, input signal, active low.
Pin 8	Drive 0 write protect, input signal, active low.
Pin 9	Ground
Pin 10	Reserved

Table C-3 lists the Host Adapter ID selections.

Table C-3 Host Adapter ID Selections

SW3-1	SW3-2	SW3-3	Initiator ID
ON	ON	ON	Host adapter ID = 7 highest priority (F)
ON	ON	OFF	Host adapter ID = 6
ON	OFF	ON	Host adapter ID = 5
ON	OFF	OFF	Host adapter ID = 4
OFF	ON	ON	Host adapter ID = 3
OFF	ON	OFF	Host adapter ID = 2
OFF	OFF	ON	Host adapter ID = 1
OFF	OFF	OFF	Host adapter ID = 0, lowest priority

Note (F) means factory setting.

Table C-4 lists remaining switch settings.

Table C-4 Switch Settings

SW3-4	ON	Enable tape fast search option
SW3-4	OFF	Normal operation (F)
SW3-5	ON	Tape Monitor Utility enabled Disk SCSIformat ON-LINE enabled
SW3-5	OFF	Tape Monitor Utility disabled (F) Disk SCSIformat ON-LINE disabled (F)
SW3-6	ON	Tape sync mode disabled
SW3-6	OFF	Tape sync mode enabled (F)
SW3-7	ON	Disk sync mode disabled
SW3-7	OFF	Disk sync mode enabled (F)
SW3-8	OFF	Reserved (F)
SW3-9	ON	Enable Disk Truncate Mode
SW3-9	OFF	Normal Operation—No Truncation (F)
SW3-10	OFF	Reserved (F)

Table C-5 CQD-420 Jumper Pin Assignments

W1	OUT	Reserved (F)
W2	IN	Differential SCSI terminator power enabled (F)
W2	OUT	Differential SCSI terminator power disabled
W3	OUT	Reserved (F)
W4	1-2 IN	Eprom Size 512-Kbit or 1-Mbit
W4	2-3 IN	Eprom Size 256-Kbit
W5	OUT	0 Wait State for Eprom Cycles (F)
W5	IN	1 Wait State for Eprom Cycle
W6-1	OUT	Adaptive DMA enabled (F)
W6-1	IN	Adaptive DMA disabled
W6-2	OUT	Adaptive DMA Dwell Time enabled (F)
W6-2	IN	Adaptive DMA Dwell Time disabled
W6-3 W6-4	IN IN	0.8-µs DMA dwell time
W6-3 W6-4	OUT IN	1.6-µs DMA dwell time
W6-3 W6-4	IN OUT	3.2-µs DMA dwell time (F)
W6-3 W6-4	OUT OUT	6.4-µs DMA dwell time
W6-5	OUT	Block mode DMA enabled (F)
W6-5	IN	Block mode DMA disabled
W6-6 W6-7	OUT IN	Auto-Bootstrap address = 773000
W6-6 W6-7	IN IN	Auto-Bootstrap address = 771000
W6-6 W6-7	OUT OUT	Auto-Bootstrap disabled (F)
W6-6 W6-7	IN OUT	Auto-Bootstrap address = 775000
W6-8	IN	Reserved (F)
W7-1 to W7-3	OUT	Reserved (F)
W8	1-2	22-Bit addressing (F)
W8	Cut	18-Bit addressing—cut the connection 1-2
Single-ended adapter	IN	Single-ended channel enabled (F)
Differential-ended adapter	IN	Differential channel enabled

Note (F) means factory setting.

CSR Address Selections

Table C-6 lists the 31 disk CSR addresses supported by the CQD-420/TM with the IC P42001A in U30.

Table C-6 **CQD-420/TM CSR Addresses (Disk Only)**

Address	LSI-11	Micro VAX	SW2-1	SW2 -2	SW2 -3	SW2 -4	SW2 -5
1	17772150	200001468	ON	ON	ON	ON	ON
2	17760334	200000DC	ON	ON	ON	ON	OFF
3	17760354	200000EC	ON	ON	ON	OFF	ON
4	17760374	200000FC	ON	ON	ON	OFF	OFF
5	17760340	200000E0	ON	ON	OFF	ON	ON
6	17760344	200000E4	ON	ON	OFF	ON	OFF
7	17760350	200000E8	ON	ON	OFF	OFF	ON
8	17760360	200000F0	ON	ON	OFF	OFF	OFF
9	17760364	200000F4	ON	OFF	ON	ON	ON
10	17760370	200000F8	ON	OFF	ON	ON	OFF
11	17760400	20000100	ON	OFF	ON	OFF	ON
12	17760404	20000104	ON	OFF	ON	OFF	OFF
13	17760410	20000108	ON	OFF	OFF	ON	ON
14	17760414	2000010C	ON	OFF	OFF	ON	OFF
15	17760420	20000110	ON	OFF	OFF	OFF	ON
16	17760424	20000114	ON	OFF	OFF	OFF	OFF
17	17760430	20000118	OFF	ON	ON	ON	ON
18	17760434	2000011C	OFF	ON	ON	ON	OFF
19	17760440	20000120	OFF	ON	ON	OFF	ON
20	17760444	20000124	OFF	ON	ON	OFF	OFF
21	17760450	20000128	OFF	ON	OFF	ON	ON
22	17760454	2000012C	OFF	ON	OFF	ON	OFF
23	17760460	20000130	OFF	ON	OFF	OFF	ON
24	17760464	20000134	OFF	ON	OFF	OFF	OFF
25	17760470	20000138	OFF	OFF	ON	ON	ON
26	17760474	2000013C	OFF	OFF	ON	ON	OFF
27	17760500	20000140	OFF	OFF	ON	OFF	ON
28	17760504	20000144	OFF	OFF	ON	OFF	OFF
29	17760510	20000148	OFF	OFF	OFF	ON	ON
30	17760514	2000014C	OFF	OFF	OFF	ON	OFF
31	*special disk mode		OFF	OFF	OFF	OFF	ON
32	disable disk		OFF	OFF	OFF	OFF	OFF

*temporarily set at CSR=17760520

Table C-7 lists the tape CSR addresses supported by the CQD-420/TM with the IC P42001A in U30.

Table C-7 CQD-420/TM CSR Address Selections (Tape Only)

Address	LSI-11	MicroVAX	SW2 -6	SW2 -7	SW2 -8	SW2 -9	SW2 -10
1	17774500	20001940	ON	ON	ON	ON	ON
2	17760404	20000104	ON	ON	ON	ON	OFF
3	17760444	20000124	ON	ON	ON	OFF	ON
4	17760504	20000144	ON	ON	ON	OFF	OFF
5	17760544	20000164	ON	ON	OFF	ON	ON
6	17760410	20000108	ON	ON	OFF	ON	OFF
7	17760450	20000128	ON	ON	OFF	OFF	ON
8	17760454	2000012C	ON	ON	OFF	OFF	OFF
9	17760414	2000010C	ON	OFF	ON	ON	ON
10	17760420	20000110	ON	OFF	ON	ON	OFF
11	17760460	20000130	ON	OFF	ON	OFF	ON
12	17760510	20000148	ON	OFF	ON	OFF	OFF
13	17760514	2000014C	ON	OFF	OFF	ON	ON
14	17760520	20000150	ON	OFF	OFF	ON	OFF
15	17760550	20000168	ON	OFF	OFF	OFF	ON
16	17760554	2000016C	ON	OFF	OFF	OFF	OFF
17	17760560	20000170	OFF	ON	ON	ON	ON
18	17760604	20000184	OFF	ON	ON	ON	OFF
19	17760610	20000188	OFF	ON	ON	OFF	ON
20	17760614	2000018C	OFF	ON	ON	OFF	OFF
21	17760620	20000190	OFF	ON	OFF	ON	ON
22	17760644	200001A4	OFF	ON	OFF	ON	OFF
23	17760650	200001A8	OFF	ON	OFF	OFF	ON
24	17760654	200001AC	OFF	ON	OFF	OFF	OFF
25	17760660	200001B0	OFF	OFF	ON	ON	ON
26	17760704	200001C4	OFF	OFF	ON	ON	OFF
27	17760710	200001C8	OFF	OFF	ON	OFF	ON
28	17760714	200001CC	OFF	OFF	ON	OFF	OFF
29	17760744	200001E4	OFF	OFF	OFF	ON	ON
30	17760750	200001E8	OFF	OFF	OFF	ON	OFF
31	*special tape select mode		OFF	OFF	OFF	OFF	ON
32	disable tape		OFF	OFF	OFF	OFF	OFF

*temporarily set at CSR=17760760

D

VMS SYSGEN Connect Statement

To properly use the *CONNECT* statement in the SYSGEN Utility of VMS 5.0 and newer versions, the following rules must be followed.

1. Run the SYSGEN Utility, from either terminal mode or through a command file by entering at the system prompt *MC SYSGEN.*

   It is recommended that you use *SYCONFIG.COM* if an automatic command file is used.

2. Issue the *CONNECT* statement to connect the controller by entering the following line at the *SYSGEN* prompt:

   CONNECT aaaa/ADAPTER=bbb/CSR=%Occcccccc/ VECTOR=%Oddd/DRIVER=eeDRIVER

   Where:
   aaaa—the designation of the controller (no :) such as PTB0.
   bbb—the adapter number which can be found from the *SYSGEN* utility *SHOW/CONFIG* (the NEXUS number) in decimal.
   cccccccc—the CSR of the controller being added on the specified NEXUS preceeded by %O (letter O) in octal.
   ddd—the VECTOR of the controller being added on the specified NEXUS preceeded by %O (letter O) in octal.
   ee —the name of the driver for the controller being connected.

3 Issue the next *CONNECT* statement to connect the drive by entering the following line at the *SYSGEN* prompt:

CONNECT ffff/NOADAPTER/SYSIDHIGH=%Xgggg/
SYSIDLOW= %Xhhhhhhhh/DRIVER=iiDRIVER

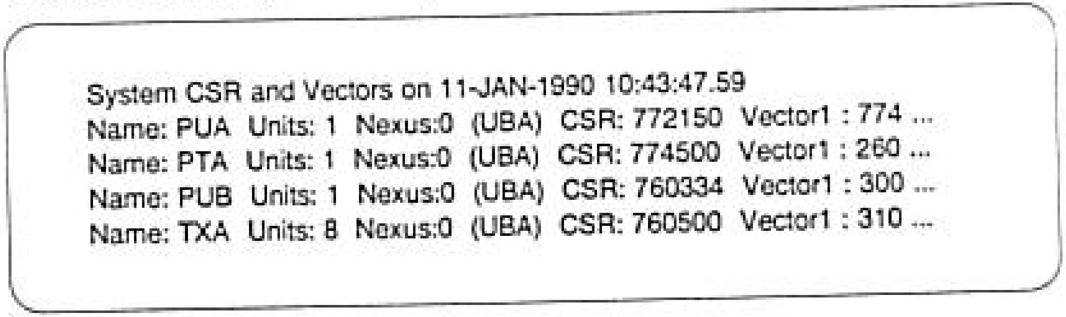
Where:
ffff —the designation of the drive (no :) such as *MUB0*.
gggg—the *SYSIDHIGH* number which is 8000 plus the *NEXUS* number.
hhhhhhhh—the *SYSIDLOW* number which can be obtained after the controller is connected by using the *SYSGEN* utility *SHOW/UNIBUS*. The newly attached controller will be seen at the CSR address previously specified followed by the *SYSIDLOW* number seen in (*hhhhhhhh*

[EXAMPLE] you may wish to connect a tape drive to a MicroVAX 3300. This tape drive is the third MU: device to be added to the Q-bus. The *AUTOCONNECT* recommended CSR for this device will not be used but the CSR of 760444 will be used instead with a VECTOR of 340 on UB0.

3 View the configuration files by entering the following line at the system prompt:

MC SYSGEN
SHOW/CONFIG

The screen displays the configuration as shown in Figure D-1:



```
System CSR and Vectors on 11-JAN-1990 10:43:47.59
Name: PUA  Units: 1  Nexus:0  (UBA)  CSR: 772150  Vector1 : 774 ...
Name: PTA  Units: 1  Nexus:0  (UBA)  CSR: 774500  Vector1 : 260 ...
Name: PUB  Units: 1  Nexus:0  (UBA)  CSR: 760334  Vector1 : 300 ...
Name: TXA  Units: 8  Nexus:0  (UBA)  CSR: 760500  Vector1 : 310 ...
```

Figure D-1: SYSGEN Config File

Note the Nexus number *0* for the specified bus.

4 Edit the configuration file to connect the devices by entering the following line at the *SYSGEN* prompt:

```
CONNECT PTC0/ADAPTER=UB0/CSR=%O760444/
VECTOR=%O340/DRIVER=PUDRIVER
```

5 Find the address for the Q-bus by entering *SHOW/UNIBUS*

Figure D-2 shows the address:

```
Address 760444 (8002A924) responds with value 0020 (hex).
```

Figure D-2: Unibus Address

6 Note the *SYSIDLOW* value.

7 Calculate the *SYSIDHIGH* value by adding 8000 to the NEXUS 0 (which is 8000) and enter the following lines at the *SYSGEN* prompt:

```
CONNECT MUC0/NOADAPTER/SYSIDHIGH=%X8000/
SYSIDLOW=%X8002A924/DRIVER=TUDRIVER

*EXIT* (CONTROL Z to exit)
```

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